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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLVII. No. 3060.] LONDON, JANUARY 4, 1922. [74TH YEAR. PRICE 1s.

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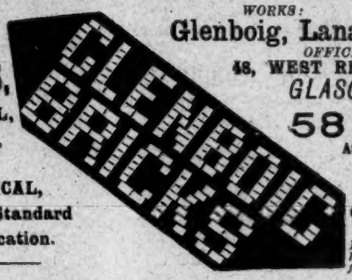

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VOL. CLVII., No. 3060.] WEDNESDAY, JANUARY 4, 1922. [74TH YEAR.

EDITORIAL NOTES.

The New Year.

THERE is a feeling of confidence in the country that the current year is going to be better than the past one. The industrial and trade prophets, at any rate, tell us this is so; and we hope they are right. There is abundant room for something much better. The black, ugly troubles of the past year are things which we could wish were only memories without their material accompaniments in disastrous effects. But disastrous as they were materially, it is partially upon them that hope is being built for the new-born year. By them light was thrown into dark places in many men's minds. The social idealists and theorists of the extreme order—particularly those who have forced their way into trade union counsels—were thrown headlong back into their proper places, though making ineffectual and absurd attempts to struggle against inevitable conditions, and conditions that are too strong for fantastic creeds and wild fancies. The year was an educational one for the rank-and-file in industrial labour. The workers have seen that, while their unions were able to bring about additional pay when exceptional conditions and demands favoured, the unions cannot prevent a downward course of wages when any adverse economic conditions exist, and there is nothing exceptional to support high wages. All their efforts to resist a true balance between costs of production and the receptive conditions of markets at home and abroad, only result in economic dislocation and unemployment and in short-time working beyond what there would be otherwise.

Of course, we do not suggest, with before us the bad financial state of countries abroad, and the world-wide trade depression, that home trade-union wage excesses and resistance of economic laws are the sole causes of unemployment and short-time working. But the industrial workers have, through the past year's troubles, and particularly through the futile coal strike, with its additional creation of baneful trade conditions and unemployment, been made to see that high wages, low production, uncompetitive costs of production, bad trade, and unemployment are inter-related. The year's industrial and trade history has, indeed, been powerfully instructive. It has done more than anything has ever done before to counteract false teachings. It has done more to induce a growing appreciation among industrial employees that their employers have their serious difficulties, that they cannot escape adverse conditions, and that it is necessary they should have the cordial and loyal assistance of all their workers in their endeavours to alleviate them. There are signs of a more amicable spirit on the part of industrial workers, of an improved co-operation between them and their employers, and they appreciate now more than ever that the very things that affect the employers are the things that affect the ability to pay wages (whatever they may be) as well as the measure of employment.

That is good. It may not all be general. But the past year has brought about a decided change which has dammed the tide of mistaken beliefs, and has set a tide of elementary economic facts flowing which will be all to our advantage in securing more peaceful working, and more helpful co-operation in the promotion of the welfare of industry. Given this, it will do much to help the country's industries to face the world on better terms than those that have had post-war existence. Another thing which has happened is that the British and French Governments have decided to investigate the question of the economic reconstruction of Europe, with the view of stabilizing finances and reviving international trade. This, if successful, should materially help our export and shipping business, to the benefit of British manufactures. In all this the gas industry has a very deep concern. Its prime commodity is indispensable to-day; but the magnitude of trade in it depends very largely upon the prosperity, and therefore upon the spending power, of the people and the multifarious industries of the country. It also relies (we may say) almost completely upon other industries for its supplies of materials for its productions, plant, and goods; and it has been carrying a burden of costs that has been repressive of the interests of the community, of itself, and of its own workers. The more extensive its business through a low price, the greater the employment. Since the coal strike the cost of coal has been reduced; but mainly through industrial depression there has been a grave falling-off in the demand for, and in the prices of, certain of the secondary products of coal carbonization. This again has reacted upon the price of gas. These are matters industrial workers should know of, and should realize their importance. But the price of coal has been reduced, though still about double what it was before the war. Railway rates for coal, coke, iron, and steel are being reduced, though not to the extent hoped for. But such as the reduction is, it is a gain. The trade unions associated with the gas industry have realized the need for the workers making their contribution to improved conditions for the industry, by a reduction of the war-time increases of wages, and for these having an economic basis. With the revival of the industries and of trade, the demand for gas and for secondary products should increase, and the improvement and expansion of business should react beneficially upon the employment the industry can offer. Financial conditions, too, are easier; and, through the Gas Regulation Act, rehabilitation of the gas industry's internal financial conditions has set-in with substantially good effect. We are learning more about the economic production of therms by the various processes, upon which research is still being made, and engineers and contractors are busy with the view of achieving further gains. Our gas appliance manufacturers, too, are producing appliances of higher efficiency, and suitable to the currently supplied grades of gas. Greater enterprise, better organization, a larger policy, and the recognition of the need for fully competent men at the gas sales end are among the things that are seen, and are daily materializing to a larger extent.

Some of these things have been accomplished; some are more or less prospective. But everything seems to presage movement in the right direction. Looking at all these matters, there is good ground for the belief and even for prediction that the coming year will see the gas industry building-up more stable conditions and enjoying, with its customers, an enhanced prosperity. For that, the resolution of all in the industry to-day should be, "We will work."

The Gas Wages Sliding-Scale Makes Further Movement.

MENTION is made in the foregoing article of the realization among the responsible trade union leaders identified with the gas industry of the need for wages being reduced in a manner systematic and fair alike to employees, employers, and customers of gas undertakings. It is a necessary contribution to the reinforcement of the position of the industry by lower costs of production and a lower selling price for its prime commodity; it is a necessary contribution to investing the industry with the ability to meet the new economic conditions; and it is a contribution to the insurance of the largest possible capacity for employment being achieved and maintained. Under the reasonable agreement whereby

wartime and after-additions to wages move correspondingly with cost-of-living changes, a second wage adjustment is now due, dating from the 2nd inst. The scheme under which this takes place was described in our issue for Nov. 2. According to it, the average of the cost-of-living figures for September to November has been taken; and the result is that the reduction will be 1½d. per hour, with, in addition (in the case of those undertakings entitled to deduct it), the appropriate proportion of the 12½ p.c. or the 7½ p.c. bonus in respect of workers of 21 years of age and over. This means for shift workers 1s. per shift, *plus* 12½ p.c. thereon; for day workers and other workers who are not either shift or piece workers, 1½d. per hour, *plus* the 12½ p.c. thereon; and for piece workers a corresponding reduction, *plus* 7½ p.c. thereon. The same applies to workers of 18 years and under 21 years of age; but in their case there is no bonus to be deducted. For all workers over 18 years of age, employed by undertakings not entitled to deduct the Ministry of Munitions war bonuses, corresponding reductions (other than in respect of bonuses) will have effect. The total of the reductions in wartime and after-additions to wages that have taken place in the gas industry is but a modicum in the industrial aggregate of decline in the extra payments due to the cost of living. Bearing upon this, an interesting piece of self-sacrifice on the part of Cleveland blast-furnacemen is reported. They are anxious to see a substantial revival of the iron trade. Under the sliding-scale, their wages fell during the course of last year from 170¼ to 77¼ p.c. above the standard. Even this fall is not enough. The men have accordingly agreed to suspend the sliding-scale, and as from Jan. 1 the district percentages payable on the base rates are to be reduced from 77¼ to 36 p.c. This voluntary act is sound co-operation.

Carbon Monoxide.

"THE TIMES" has published an editorial article headed "Domestic Gas." It should have had the title "Carbon "Monoxide." Our contemporary does not know much, if anything, about the subject. What it has chosen to publish in the article, it apparently takes from a contribution by "W.A.B." to "Nature." We do not intend to offer prizes for the discovery of the person to whom the initials "W.A.B." apply. Too many prizes would be required. It is clear from the appearance of the article that that gentleman (who unfortunately was unable, through an operation, to give evidence on the subject before the recent Departmental Committee, and to be subjected to examination) is not seemingly willing to abandon the unprofitable task of "beating the air" in respect of this particular matter. "The Times" refers to ancient history. It again drags to the surface the Home Office Committee of 1899 and their recommendations, which have found nothing to support them during the past twenty-two or so years, in the course of which the mixture of water gas with coal gas has grown, and during which we have had the war time and coal strike experiences, and the tremendous use of gas through the prepayment system by the poorer section of the community. It has been a wonderful experience.

"The Times," however, comes out with this feeble statement, whether or not extracted from "W.A.B.'s" article cannot be said, as we have not consulted it: "The deaths "from gas-poisoning have increased both in this country and "in the United States *pari passu* with the increase of the "diluting water gas." That is beautifully positive and absurd. It would not be if the number of consumers had stood still, and if the volume of gas used in the British Isles had remained at the figure before the advent of water gas. "The Times" would do well to study the question comparatively from the point of view of the relation of deaths from gas poisoning to volume of gas consumed and to numbers of consumers anterior to the use of water gas and now, or during the coal strike when the proportion of water gas was at its maximum. A paper of its position ought not to rely upon postulation, however high in the scientific world the person may be who indulges in it. We have seen no data yet that supports any demand for restriction of carbon monoxide in town gas. On the contrary, the statistics placed before the recent Departmental Committee, when sensibly examined on the basis of population, gas consumers, volume of gas delivered, or any other rational basis, disclosed how modest is the contribution of gas to fatalities in this country. "The Times" apparently knows nothing of the practical advantages of carbon monoxide in gas; but it has a capacity for swallowing assertion built upon the well-known toxic property of carbon monoxide. There is the risk; but in these days when people know so much of the risk, there is care, and the worst fears of the meticulous ones come to nought. Mechanically-driven road vehicles have increased the risk to human life, so has electricity at common voltages. But there is no such trouble over them as "W.A.B." persistently introduces into this question of carbon monoxide in town gas. Our morning contemporary hopes that the matter will be subjected to thorough inquiry by disinterested persons. Was not the recent Departmental Committee composed of "disinterested persons?" If the Government had listened to that scientifically constituted Committee of 1899, the gas industry of the country would have had a terrible set-back, and so would national economy and interests. "W.A.B." pipes loudly for coal economy on the one hand, but the carbon monoxide "stunt" also pleases him, although the two things do not synthetize well. We commend to our morning contemporary a careful reading of the evidence given before the recent Departmental Committee as an antidote to misconceptions formed by the reading of the article in "Nature."

Since writing the above, Dr. Carpenter, as Chairman of the Gas Companies' Protection Association, has sent a letter to our morning contemporary which should allay any misapprehensions that may have been occasioned in the public mind by the misinstructed writer of the leader upon which comment has been made. As Dr. Carpenter points out, the gas supply of the entire kingdom is now under the scientific control of three independent experts appointed by the President of the Board of Trade; one of them being the eminent physiologist referred to in the leading article—Dr. J. S. Haldane, F.R.S. The public may, Dr. Carpenter thinks, rest assured that any peril of the kind suggested would not be allowed to continue without action on the part of these gentlemen, and that whatever risk may exist to-day would be immeasurably less than one day of the fog often experienced in London and other of our large cities, in the combating of which water-gas production plays a very important part. With the care taken to-day in the fitting-up of houses for gas, a person would be much more likely to inhale traces of carbon monoxide during an afternoon walk down Bond Street, especially if enjoying at the same time a Havana cigar, than in any apartment—domestic or otherwise—to which a supply of town's gas had been laid on.

New Nomenclature and Capacities for Dry Meters.

THE nomenclature of gas-meters is being changed for the better, and so are the capacities in any given size of case. The description of the sizes of meters by a certain number of "lights" is a survival from the days of what we now regard as primitive gas lighting. Gas undertakings will soon be unable to purchase meters the capacities and sizes of which are described by a number followed by the word "light." Only the meters so described that are to-day in stock in the meter makers' stores are so purchasable; and when they are exhausted no more will be available. Under the new numerical description, the capacity will bear no relation, though externally the size of the meter case may do so, to anything that formerly came under the description of "lights." Before long, if customers send orders to the makers for meters of so many lights, the latter will arch their eyebrows, and wonder what manner of man this is whose style of instruction comes to them as out the distant past. Everything has changed in connection with gas supply and gas use, and description in "lights" has now no application to the modern method of lighting, nor to the diversity of gas uses and volumes involved. Moreover, with increasing gas uses through the old meters, these have become overtaxed, and there has been slow registration, and somewhat sad havoc has been played with the durability of the meters. Consequently complaints have been prevalent.

As is well known, a Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries considered the position, with the result that a revised specification for new standard sizes of dry meters was issued, which apply as from the 1st inst. Now the meter makers have asked us to call attention to the information which they are issuing in relation to the matter. We have pleasure in doing so, as well as reprinting it *in extenso* in later columns. As will be seen, the sizes will now be known by the serial numbers 1 to 12, indicating the quantity of gas in cubic feet per revolution for which the meter is rated, and the

maximum number of revolutions per hour at which the meter can be judiciously worked without adverse results. But this quantity, as we have said, has no relation to the volume of gas that meters with the same case dimensions formerly passed. The meter makers explain that the capacity per revolution of each new size of meter in a case corresponding to the former dimensions is considerably increased by the use of larger valves and gasways, and by fitting diaphragms which give a larger displacement. For instance, a No. 2 meter, capable of passing 40 c.ft. per hour, may be fixed without any alteration of connections where a 3-light meter, which had a badged capacity of 18 c.ft. per hour, is at present in use. Another improvement is that the full capacity based on the rate per revolution and the number of revolutions per hour is obtained without loss of pressure between the inlet and the outlet exceeding 0·5 in. This conforms to the new regulations.

The two points we want to emphasize specially are: First, that the meter makers trust that gas companies will, as soon as convenient, adopt the new list as recommended by the National Gas Council; and, secondly, that engineers will observe that, while the sizes of the cases in the new list have been kept as small as possible, in comparing the prices it is not the size of the outer case of the meter which should be taken into consideration, but the capacity per revolution, and it will be seen that the new list gives an advantage in price over that ruling at the present time. An additional advantage might be pointed-out. It is that, if the speed per hour suggested for each size of meter is adhered to, there will be no fear in the future of meters being overworked, with consequent serious loss to the gas suppliers by the tendency, in that case, to register on the slow side. From the names given elsewhere, it will be observed that the whole of the meter trade has adopted the new list.

The Grate and the Fuel—A Suggestion to the Board of Fuel Research.

In reviewing last week the Board of Fuel Research Technical Paper No. 3, giving the results of Dr. Margaret White Fishenden's tests with low-temperature coke cakes and with coal, two things that struck us were the great variation that was shown between the efficiency performances of various types of fire grates, and how relatively little difference there was between the radiation efficiency of the low-temperature coke and the coal used in the experiments. This means that the idea that people will pay a higher price for low-temperature coke than for coal is likely to prove to be a case of misplaced optimism. Low-temperature coke has not yet—after the passing of several years, the design of many forms of carbonizing plant, the expenditure of much labour, and the squandering of a considerable sum of money—been proved commercially possible. Supposing it was so proved, the production of a solid fuel which is, compared with gas coke, comparatively easy to ignite, and which would burn in any ordinary grate, appears to be all that would be accomplished. This, it seems to us, is mere pandering to the crude simplicity of the ordinary grate, which, if any merit at all can be claimed for it, is designed purposely to retard combustion. Hence the difficulty with ordinary gas coke in such grates. But the difficulty cannot reasonably be attributed as a fault of the coke. What is wanted is that grates in new houses should be adopted (in places where gas is not used) that will burn gas coke, which must be produced. The same when present grates wear out and new ones have to be substituted, or there is a desire to replace the old forms by types which will burn a solid smokeless fuel. Modification of the grates for gas coke is the correct solution of the problem, and the best thing in the interests of fuel conservation. Gas coke, being made at 1600 or so gas-works up and down the country, is already well distributed. To make provision for its use would be infinitely better than to attempt, at immense trouble and cost, radically to modify the valuable smokeless and sturdy characteristics of gas coke. If only the new dwellings now being erected were fitted with such grates, the immediate increased demand for coke in most districts would be as much as could be comfortably satisfied, pending extensions to carbonizing plant. And this would be an immediate service to the nation, to the gas consumers, and to the community in promoting a sanitary atmosphere.

By experiments such as those of Dr. Fishenden, the lay mind is no doubt impressed with the idea that, in order to realize smokeless domestic heating, it is necessary to start *de novo* in the production of smokeless fuel. In a previous report issued by the Fuel Research Board, as well as in her evidence before the Committee on Smoke Abatement ["JOURNAL," March 30, 1920, p. 757], Dr. Fishenden related the results of similar experiments with coal, gas coke, and low-temperature coke. That she had endeavoured to carry out her experiments with great care was obvious. If one criticism may be made of the investigation, it is that the value of the results was materially depreciated by the fact that the same grates were used for free-burning house coal as for gas coke—thus showing a disregard for the radically different characteristics of these fuels. This very serious handicap notwithstanding, coke triumphed. In her evidence before the Smoke Abatement Committee, Dr. Fishenden said: "Dried gas coke was found to emit radiation equivalent to about 24½ p.ct. of the total heat of the coke burned in a small barless grate, as compared with 21 p.ct. for coal burning in the same grate. In a small register grate, the coke gave radiation equivalent to about 28½ p.ct. of the calorific value consumed, as compared with 24 p.ct. for coal burning under similar conditions in the same grate. The calorific value of the dry coke was about 13,000 B.Th.U. per pound, and that of the coal 14,500 B.Th.U. per pound; and it could easily be calculated that the coke gave, weight for weight, 4 or 5 p.ct. more radiation than the coal." In her Fuel Research report, Dr. Fishenden said much the same thing: "Weight for weight, dry coke of a calorific value 13,000 B.Th.U. per pound gave some 4 or 5 p.ct. more radiation than coal of a calorific value of 14,500 B.Th.U. per pound, in the same grate, and burning under similar conditions." No better testimony could be wished for, having regard to the "similar conditions." Here gas coke, fired under conditions obviously unsuitable, gave a marked increase in thermal efficiency. If the coke was fired, as it should be, in a refractory lined grate, designed to induce its own convection currents, regardless of chimney draught conditions, its radiant efficiency would be developed to the maximum; and it would unquestionably compare most favourably with low-temperature coke. Overmuch is made of the kindling difficulty with coke. Anthracite, for instance, relatively dense in structure, and possessing a comparatively high specific heat, is regularly kindled with wood in the ordinary way in open grates.

Such a grate as the one just indicated for gas coke is available in that known as the "N.C." open coke grate, which has a closed ash-pit, and a series of deep vertical channels at the back and sides extending from the hearth level to a point above the normal level of the fuel in the grate. These channels function in a manner necessary to secure a brilliantly incandescent fire with coke fuel. They really act as miniature chimneys, inducing convection currents of air inwards through the fuel bed from the front to the back of the grate, and then upwards through the channels. The retarding or controlling of combustion to suit varying atmospheric conditions is accomplished by adjustment of the ventilator in the ash-pit cover or fret. This admits cold air to the lower end of the channels which communicate with the ash-pit and underside of the fire grating. This has the effect of chilling the channels, and diminishes the upward draught, which is no longer concentrated on the fuel, but merely pulls more or less cold air through the ash-pit. Combustion is thus slowed-down or controlled as required. In any ordinary slow-combustion grate, the operation is, of course, just the reverse. There are other details of this grate; but sufficient has been said to show the general principles. The "N.C." open coke grate is, of course, quite distinct from the forms of coke stoves to which Mr. F. D. Marshall recently called attention: and it is constructed for fitting in any place where provision has been made for an open slow-combustion coal grate.

This brings us to the question: If there is in existence a grate that will promote the active and satisfactory combustion of gas coke, which is daily being produced in every city and town, as well as in many villages, of the country, why trouble about spending huge sums of money on plant to produce a coke in which valuable volatile matter is left? Superfluous work is not an economy—and particularly in these times. Instead of continuing the tests with low-temperature coke cakes, and striving to discover a means of making low-temperature carbonization a commercial success when fickle markets are temporarily favourable, the Board of Fuel Research should surely pass at once to a test of the "N.C." grates or any others that offer for the domestic utilization of the coke already available? It is a pity that

grates that are designed specially for an existing class of fuel should be ignored. The Ministry of Health and the London County Council should also look into the matter, if they desire to render a real service to the public in respect of smokeless fuel. The grate has been in use now some twelve months by one investigator; and from his experiences with ungraded gas coke of very ordinary quality, we feel safe in saying that the results of experiments conducted by the authorities mentioned would enlighten many who are ignorantly prejudiced against gas coke, and who are clamouring for low-temperature coke, instead of for a grate that will give a high efficiency with smokeless fuel daily produced and well distributed throughout the country. It would be interesting to know why they limit themselves to the one objective without ascertaining whether there is not an alternative ready at hand. They might also mix a few healthy economic considerations with the broader exploration of the question. However, we do suggest that the appropriate authorities should test the utilization of gas coke under suitable burning conditions, and not endeavour to judge it under conditions designed for a material of altogether different chemical and physical characteristics.

Walter King, Limited.

An announcement has to be made, which perhaps concerns ourselves more than anyone outside our office, though we believe it will have interest for many old-time friends. The "GAS JOURNAL" and its subordinate business will, from and including this issue, be conducted by a Private Company under the style of Walter King, Limited. To this Company, Mr. Walter King has relinquished the proprietary rights which he and his father before him have held for forty-nine years. But in the Company he is the chief shareholder; and his "co-partners" are the principal members of the staff. No one outside Mr. King's sons and the members of the staff has been admitted as a shareholder; and, in addition, there will be no constitutional change in the staff. Therefore, the complete independence of the "JOURNAL" as a servant of the gas industry is secured; and assured is the continuation of the principles and policy that have been applied to its conduct, and have through the seventy-three years of its existence stood for the progress of the industry, and the well-being of all associated with it. The Directors of the Company are Mr. Walter King, Mr. Clifford A. King, and Mr. Arthur F. Bezant. Mr. King, as Chairman, will continue his supervision of the work of the "JOURNAL." His son, trained as an engineer, will also take his part on the literary side. Mr. Bezant, whose whole working life has been spent in the service of the gas industry, will continue his journalistic work as head of the editorial staff. Two other old colleagues should be mentioned. Mr. A. Harrison will retain his position as chief assistant in the editorial department; and Mr. J. A. Morris will continue in charge of the advertisement side of the business.

Coal Output.

A healthier state of things regarding coal production is recorded for the week ending Dec. 17. The output was then 5,026,800 tons, as compared with 4,855,100 tons the previous week. We have to go back to Dec. 18, 1920, to find another week's output to compare with it. Then the figure was 5,307,000 tons; but more men were employed.

Super Gasholders.

America we think can boast of the largest number of gasholders of 10 million cubic feet and over. Baltimore has just added another to the list; and we are indebted to Mr. George Beadenkopf, the Chief Engineer of the Consolidated Gas, Electric Light, and Power Company of that city, for the description and photographs of the mammoth structure given in another part of this issue. The holder is a 10-million cubic feet one; and there are two others in New York and one in Chicago of the same capacity. In addition, New York has, at the Astoria works, a 15-million cubic feet holder. In this country, we have the South Metropolitan holder, with its working capacity of 12 million cubic feet; and Sydney has one of that capacity. The South Metropolitan Company's one was the leader in the super-holder line; and it is a memorial to the engineering enterprise and skill of Sir George Livesey. An interesting point about the Baltimore 10 million cubic feet holder is that the Company who have indulged in the large expenditure on the structure is a gas, electricity, and power one. The holder demonstrates the fact that the Company have no fear as to the future of gas. The holder is said to be the largest of the steel-tank type ever constructed.

Motor Fuel.

The producers of petrol will again breathe freely. The Board of Fuel Research has once more reported on the subject of the production of power alcohol from home-grown materials. There seems positively no chance of this happening; and if there is any commercial possibility of its being done in our Dominions, it is only likely to be on a sufficient scale to meet local requirements. Benzole producers are not interested in quite the same way as the importers of petrol, as there is no prospect of the home production of benzole doing anything more than satisfying part of the motor fuel requirements. If power alcohol was available in sufficient quantity for mixture with benzole, the demand for imported petrol might show a serious decline. The further report on power alcohol is noticed on a later page of this issue.

PERSONAL.

The amalgamation of the Margam and Aberavon Urban District Councils having left the newly-constituted Port Talbot Borough Council with two sets of officials, a special meeting held last Friday dealt with the situation. Mr. EVAN REES, who was appointed Manager of the Margam Council Gas-Works about six years ago, has now been made Manager of the combined gas-works, at a salary to be fixed later. Mr. A. J. BOND, the Manager of the Aberavon Gas-Works, was among the officials displaced. To these, the Council will have to pay compensation according to years of service.

It was intimated at Thursday's meeting of the Scunthorpe Urban District Council that, as was recorded in last week's "JOURNAL," Mr. SAMUEL MOORE had resigned his position as Gas Manager. In recommending the Council to accept the resignation, the Gas Committee expressed their high appreciation of the services which Mr. Moore has rendered to the Council during the last four years, and tendered him their best wishes for his future. Mr. Veitch (the Chairman of the Gas Committee) said it had been decided to publicly recognize the magnificent assistance which Mr. Moore had given to the Council.

Mr. H. P. ALLISON has been appointed Gas Manager to the Redcar Urban District Council, in succession to Mr. HAROLD CLAPHAM, who has resigned. Mr. Allison is promoted from the position of Assistant Manager and Chemist. He was formerly with the Stockton Gas Company, and at one time was Manager of the Yarm Gas-Works. The Redcar Council are anticipating considerable gas-works extensions.

Included in the list of New Year Honours is the name of Mr. HENRY GIVENS BURGESS, who has been made a Privy Councillor in Ireland. He was Coal and Shipping Controller in Ireland during the war, and from the time of its formation represented in that country the Ministry of Transport.

OBITUARY.

Mr. JOHN DELANEY, the Chairman and Managing Director of Messrs. W. J. Jenkins & Co., Ltd., of Retford, died on Dec. 25, at his residence, "Overdale," Settle, York., after a short illness. The interment took place on Wednesday last at the Society of Friends Burial Ground, Settle.

The death occurred on Dec. 18, at Stourbridge, at the age of 81, of Mr. EDWARD THOMAS WRIGHT, senior partner in the firm of Messrs. Westwood and Wright, of Brierley Hill. He was Chairman of the Brierley Hill and District Gas Company and a Director of the Dudley Gas Company.

Gas interests in the North of Ireland have lost an able and enlightened helper by the death of Mr. F. W. POLLOCK, Town Clerk of Lurgan, whose services to the local gas undertaking were widely recognized, while his advice and guidance were sought by other towns. Mr. Pollock made a very close study of all gas problems.

Baltimore's Large Increase in Output.—Figures lately published show that the annual output of the gas companies of the United States during the period from 1901 to 1920 increased from 101,625,366,000 c.ft. to 319,887,813,000 c.ft., or 214·8 p.ct. Within the same period, in Baltimore, the annual output has increased from 1,865,037,000 c.ft. to 9,300,129,000 c.ft., which is an increase of 398·7 p.ct. for the nineteen years. Baltimore has increased in recent years very rapidly in regard to its industrial enterprises; and the Company are pioneers, not only in merchandizing activities, but in the careful adjustment of rates to promote the maximum utilization of the Company's service.

ELECTRICITY SUPPLY MEMORANDA.

Obscurity at the New Year.

At the advent of the New Year, there is a great deal of uncertainty as to what it will bring forth for the electricity supply industry. Generating co-ordination and concentration have become stale terms. There has been much talk under both headings; and there has been much work, a good deal of inquiry, and some decisions by the Electricity Commissioners. The work and inquiry proceed. But more or less it all, at present, comes up against a blank wall, which seems impenetrable till Parliament condescends to pass a supplementary Act to the principal Act which brought into being the Electricity Commissioners. The Bill for this purpose that was introduced last year, and which was to confer certain financial powers to enable the carrying into effect of the decisions of the Commissioners, had hardly made its appearance when opposition sprung up in such volume, and of such influence, that the Government discreetly pushed the Bill out of sight, and kept it there—finally slaughtering it with the rest of the innocents at the end of the session. No one knows quite what is going to happen in this respect during the coming session—whether the same Bill will be introduced, or an amended one, or not one at all. But certainly if something is not done in the way of investing the Joint Authorities with power to raise money, much of the work of the Commissioners will continue to lie dormant. Meanwhile, the municipal owners of electricity stations, with the consent and blessing of the Commissioners, are spending money on extensions. Per unit of expenditure, the new capital is not so productive as was capital outlay before the war. Thus there is a little uncertainty as to what the effect will be on capital charges per unit. There may be something saved on the average expenditure of fuel per unit; but the fuel charge is small in comparison with the capital charges per unit. Then the Electrical Development Association are busy trying to boost-up a commercial enthusiasm which is considerably chilled directly the question of installation and electricity costs crosses the mind. The simple fact is that there are many electricity concerns that cannot afford to-day to run any risks in this regard. The ardour for speculation is not at the same level as it used to be, when some rather fanatical people thought that electricity was going to sweep the gas industry out of existence, but did not. On the contrary, they saw that the latter kept smiling and expanding. The electricity industry now has hiring powers; and small price reductions for current have begun to make their appearance. Notwithstanding, caution is one of the striking features of present-day electrical policy. On the whole, it is not an easy matter to indulge in electrical prognostications for this year.

Mr. Beauchamp and Efficiency.

If the report of a paper by Mr. J. W. Beauchamp, the Director of the Electrical Development Association, in the "Electrical Times," correctly reflects all he said, then "modern civilization" will hardly be proud of the evasion or suppression of facts when he speaks of one of the performances of gas. The matter is important, because it is Mr. Beauchamp speaking; and we should not like him to continue to make similar statements or larger ones on the point without qualification, because he would be stating something that is not the truth. He was treating of "Artificial Heating in Relation to Human Needs;" and among his examples of human needs, he spoke of the boiling of an egg. Had he been speaking of the boiling of a few gallons of water, he would no doubt have made the same blunder, because the difference is only one of degree. He said that in the cooking of an egg, the water has to be raised from 50° to 212° Fahr., and has to be kept at that temperature for a short time. In practice, ½ pint of water must be raised to boiling-point; and the whole process absorbs (say) 150 B.Th.U. He adds: "When gas is the medium employed, a quantity is used containing some 350 B.Th.U., which in turn has been made by the destruction of coal containing 1200 B.Th.U.—a performance of which modern civilization can hardly be proud." In the first place, the coal is not destroyed in making the gas—about half the weight is returned to the fuel market as coke with a calorific value nearly equal to that of the coal, and, in addition, there are the tar and the tar oils with their heating values. Mr. Beauchamp has calculated purely on the gas made by coal carbonization, and as though gas was the only product. He has allowed nothing for those many cases where part of the coke is gasified for making water gas, or where water gas is produced by the steaming of the charges in vertical retorts, and by either of which means the yield of B.Th.U. per ton of coal is considerably increased. Nor has he considered the heat units available as gas by the total gasification of coal. Mr. Beauchamp should study these matters, so as to obviate a similar slip regarding the destruction of coal containing 1200 or any other number of B.Th.U. He will find a vast difference, according to the manufacturing process, in the number of therms produced per ton. The report in our contemporary says nothing about "modern civilization" not being proud of the electrical performance in the matter of coal destruction for the production of potential heat. The heat required to raise ½-pint of water to boiling-point is 65·6 B.Th.U.; but as the operation is performed at only (say) 50 p.ct. efficiency (some boiling-rings will work at between 60 and 70 p.ct.), about 131 B.Th.U. are requisite. As an egg only needs three minutes to cook, and the consumption of gas can be reduced after the water has boiled, 360 B.Th.U. for the entire operation appears to us to be rather excessive. Electric heating elements have (when new) an efficiency for water boiling of only 40 to 50 p.ct.; so that if the 360 B.Th.U. is correct for gas, it is about right for electricity. Roughly, we may take it that one-tenth of a unit is expended, which is the equivalent of 342 B.Th.U. If an average of 3 lbs. of coal of a calorific value of 13,500 B.Th.U. are used in generating a unit of electricity, 0·3 lb. of coal, or 4050 B.Th.U., would be expended in producing the 360 B.Th.U.; if 5 lbs. of coal are expended per unit generated, then ½ lb., or 6750 B.Th.U., would be required for the production of the 360 B.Th.U. What does "modern civilization" think of this performance compared with gas and the secondary products?

Electric Salesmanship.

The second conference of electric salesmen has been held under the auspices of the Electrical Development Association. The subject for discussion on this occasion was electric-driven machines for promoting efficiency and economy in the home; and Mr. Morton opened with a paper. Electric salesmen are painfully conscious of the difficulties of promoting sales of appliances for cooking and heating at to-day's prices for these, their installation, and the current they consume. But for domestic power machines, the current consumption is small; and they can therefore be run off the lighting circuit, which is considered to be a great advantage in favour of this branch of trade. It was confessed by Mr. Morton that there are many districts to-day in which it is almost impossible to sell current-consuming devices. But there is every reason for pushing motor-driven domestic machines, because they have no competitor to fear from any other industry as have electric lighting and heating, which, however great the advantages over gas, have to face competition from that quarter. We have not yet heard what the "advantages" are over gas. Are they found in money economy, in less labour, in the conservation of coal, or where and what are they? If there are any advantages over gas, are they lost to view by the bulkiness of the disadvantages? Washing-machines and vacuum cleaners are the two forms of apparatus principally advocated. Others were ironing-machines, sewing-machines, electric dish-washers, and minor apparatus. As to the washing-machines, laundry prices to-day are sufficient to drive people to the adoption of labour-saving appliances which will enable them to do the work at home. But there is the initial cost of the things, which is quite enough to frighten all but the wealthy. However, there is always hire-purchase, which is a good policy for doing business in some things. Increased sales, too, it is urged, will bring down prices. But householders must not be told this, or they will wait-on before buying, in the hope that prices will come down through buying by other people. If householders generally followed this policy, price reduction of appliances would make fearfully slow progress. There were many excellent points as to sales methods in Mr. Morton's statements, which are the outcome of experience. Vital to success are advertising and demonstration; and he urges that, after apparatus is fixed, the salesman should make a point of calling to see that the apparatus is in working order, and that the user is quite familiar with its operation, and is getting the maximum out of it.

Electric Wiring and the Simplicity of Gas Piping.

Major Richardson, of Dundee, in an article in the "Electrician," complains that the wiring of houses has not kept pace with the advantages offered by the multi-part system of charging for and taking current in any part of a house for any purpose required. What is wanted in his opinion, is a simple system of wiring, which can be quickly and cheaply fitted-up, and be easily tapped for any purpose. The present wiring methods are far too cumbersome and costly, in the Major's view, if electricity, in addition to lighting, is to be used for heating, cooking, and auxiliary purposes wherever needed in any part of a house. The article pays a compliment to gas methods. Major Richardson says that one has only to watch "our gas competitors" pipe and fit-up similar houses for similar purposes to realize that, if electricity is to make any headway at all, existing methods of wiring must be altered, and be brought more nearly to those found in the gas-pipes run all over the house, and tapped-off as required for lighting points, cooking stoves, or heaters. Gas has all along offered a simple medium for lighting, heating, and cooking; and electricity can now through the introduction of the multi-part tariff do likewise so far as the rates for charging are concerned. In Dundee, a special wiring lay-out has been adopted, and has for demonstration been fitted-up in a seven-roomed house, including scullery, kitchen, and bathroom. Metallic sheathed surface wiring is used throughout; but the description shows that, whatever is done, electric wiring is a more complex and costly matter than piping for gas. However, among the advantages of the method are: There is always at hand a heavy main to each room, which can be conveniently and easily tapped for extensions; fusing devices are cut-down to a minimum; and a complete installation can be carried out quickly and expeditiously in houses at present employing other methods without a great deal of preliminary work, and with a minimum of trouble and annoyance to the tenant. It is an

attempt to get the conveniences of gas-piping as near as possible into the all-electric house system.

Reduced Electricity Charges.

In many places, gas has been coming down in price per therm, and in a number of places too the electricity authorities are following the lead of gas in this matter There are before us several announcements regarding electricity price reductions—some being small, and some large. One we see is a 5 p.ct. reduction, and later on another is found equal to 25 p.ct. Again it is noticed that the reductions are varied to fit all purposes. There are those that are for lighting only; while others refer to power and heating. Discounts are being given for various purposes—more particularly to encourage the domestic heating load. At Northampton, for instance, with the view of stimulating the use of electricity for heating, the suppliers are reducing the charges by 5 p.ct. up to 100 units per quarter, 10 p.ct. up to 200 units, 15 p.ct. up to 300 units, 20 p.ct. up to 400 units, and 25 p.ct. up to 500 units. It is noticed that Bexley (Kent) has had enough of the two-part or rateable value system of charging for electricity, and is reverting to a flat-rate, which for the present will be 8d. per unit. The Northallerton Electric Light Company have reduced the charge for public lighting from 7s. 6d. to 7s. 3d. per lamp per 100 hours. We mention this as 100 hours is rather a curious basis for street lighting payments.

Croydon and Business Acumen.

In a note bearing this heading in last week's "Memoranda," reference was made to the supply of electricity by the Croydon Corporation to houses on the Norbury and Woodside Housing Estates; and some criticism was made of the charge, and the amount of electricity to be supplied under the scheme. We have now before us additional particulars; and it is remarked that the 1s. 6d. per week is for lighting purposes only, under the "Limiter" system of charging for the maximum rated consumption up to 100 watts—higher maximum rates being charged at a correspondingly increased rate per week. It seems that the tenants do not like this restriction of the supply; and the Electricity Supply Committee have therefore arranged provisionally for a supply to houses on the estates through one meter for lighting, heating, cooking, &c., for a weekly payment of 1s. 6d. collected with the rent to cover the supply of 42 units per annum (six units for each summer quarter, and 15 units for each winter quarter). For all units beyond, a charge of 2½d. per unit will be made. In view of the prices that are being paid by other consumers, we are wondering whether they will not regard these charges as in the nature of preferential ones.

Gasfilled Lamps Patent.

Some time ago reference was made to an action in which the plaintiffs were the British Thomson-Houston Company, Ltd., and the defendants the Corona Lamp Works, Ltd. The cause of action was an infringement of the patent of the former for gasfilled lamps. In the first Court, Mr. Justice Sargant, while agreeing that the specification of the patent disclosed an invention of a high order of merit and of great utility, held that the Letters Patent were invalid on the ground that the claim did not sufficiently define and limit the ambit of the monopoly claimed, inasmuch as the word "large" used in the claim did not adequately define the dimensions of a filament coming within the combination claimed. The decision was upheld by the Court of Appeal; but now, on an appeal to the House of Lords, the British Thomson-Houston Company have succeeded. The ground on which their success has been achieved may be briefly stated in the words of Viscount Haldane, that there was given in the body of the specification no mere abstract principle, but a method of process of manufacture capable of being at once put into operation by any experienced electric lamp-maker, with such adaptations as his commercial requirements and standards suggested. To put it into operation required no new inventive capacity; and it would have been inconsistent with the generality and sweep of the explanation given to have inserted a definition of the word "large" otherwise than relatively to current practice. Such a definition, if attempted, would have limited unnecessarily the ground over the whole of which the new method was to be made operative. In the electricity industry there seems a very general view that this success is only just.

NEW STANDARD SIZES OF DRY METERS.

We have been requested by the meter makers whose names are appended to publish the following information regarding the new standard sizes of dry meters which have been adopted as from the 1st inst. It will be seen that the description of the sizes of meters has now been transferred from "lights" to serial numbers, as explained below.

A Committee, consisting of representatives appointed by the Institution of Gas Engineers and by the Society of British Gas Industries, have had under consideration for some time the desirability of discouraging the overworking of meters, tending, as it does, to slow registration, as well as affecting their durability. Having regard to these and other considerations, the Life of Gas-Meters Committee, after making very careful investigation and experiments, submitted to the Institution a revised specification of meters to be known as the "New Standard Sizes of Dry Meters," which that body finally approved and recommended for adoption as from Jan. 1, 1922, subject to existing stocks of meters designated by "lights" being exhausted.

The former method of distinguishing the size of a meter by the number of lights is discontinued; and the sizes are now known by serial numbers from 1 to 12, indicating the quantity of gas in cubic feet per revolution for which the meter is rated, and the maximum number of revolutions per hour at which the meter can be judiciously worked without adverse results. The capacity per revolution of each new size of meter in a case corresponding to the former dimensions is considerably increased by the use of larger valves and gas-ways, and by fitting diaphragms which give a larger displacement. For instance, a No. 2 meter, capable of passing 40 c.ft. per hour, may be fixed where a 3-light meter, which had a badged capacity of 18 c.ft. per hour, is at present in use, without any alteration of connections.

In comparing the capacities of the new standard meters with those hitherto determined according to the number of lights, it should be observed that the new testing regulations stipulate that the full capacity, based on the rate per revolution and the number of revolutions per hour, shall be obtained without loss of pressure between the inlet and outlet exceeding 0·5 in., and that, while in some of the larger-sized meters the loss of pressure exceeded this limit when their hourly capacity was rated at 6 ft. per light, the new standard sizes conform to the requirements in all instances.

A copy of the new standard specification is annexed; and it is hoped that the recommendation of the Institution of Gas Engineers will be adopted by the gas industry generally. As the old trade price list is not applicable to the new standard sizes of meters, we also annex copy of a new trade list, which has been built-up in relation to the present cost of manufacture; and future reductions of price will be by way of discount from the new list.

ALDER & MACKAY, LTD., New Grange Works, Stewart Terrace, Edinburgh.
AUTO-SLOT GAS-METER COMPANY, LTD., 105, Sherwood Street, Nottingham.
J. & J. BRADDOCK, Oldham and London. (Branch of Meters, Ltd.)
CANNON IRON FOUNDRIES, LTD., Deepfields, nr. Bilston, Staffs.
W. & B. COWAN, Fitzalan Street Works, Kennington, London, S.E. 11. (Incorporated in Parkinson and W. & B. Cowan, Ltd.)
GAS-METER COMPANY, LTD., 238, Kingsland Road, London, E. 2.
GEORGE GLOVER & CO., LTD., Ranelagh Works, Royal Avenue, Chelsea, London, S.W. 3.
THOMAS GLOVER & CO., LTD., Gothic Works, Angel Road, Edmonton, London, N. 18.
DAVID GRANT & CO., East Cross Causeway, Edinburgh.
HUTCHINSON BROS., LTD., Falcon Works, Barnsley.
R. LAIDLAW & SON (Edinburgh), LTD., Simon Square Works, Edinburgh.
METROPOLITAN GAS-METERS, LTD., Hyson Green Works, Nottingham.
JAMES MILNE & SON, LTD., Milton House Works, Abbeyhill, Edinburgh.
GEORGE NEWTON, LTD., Academy Street, Warrington.
GEORGE ORME & CO., Atlas Meter Works, Park Street, Oldham. (Branch of Meters, Ltd.)
W. PARKINSON & CO., Cottage Lane, City Road, E.C. 1. (Incorporated in Parkinson and W. & B. Cowan, Ltd.)
PEEBLES & CO., LTD., Tay Works, Bonnington, Edinburgh.
PINCHBECK, LTD., Adams Place, Georges Road, Holloway, N. 7.
SAWER AND PURVES, Nelson Meter Works, Miles Platting, Manchester. (Branch of Meters, Ltd.)
SMITH METERS, LTD., 186, Kennington Park Road, S.E. 11.
SUTHERLAND METER COMPANY, LTD., Electric Avenue, Witton, Birmingham.
A. G. SUTHERLAND, LTD., Warwick Road, Greet, Birmingham.
JOHN AND JOSEPH TAUNTON, LTD., Sherbourne Road, Balsall Heath, Birmingham.
WILLEY & CO., LTD., Engineers, Exeter.
GEORGE WILSON GAS-METERS, LTD., Foleshill Road, Coventry.

NEW STANDARD SIZES OF DRY METERS.

No.	Capacity per Hour.	Capacity per Revolution.	Revolutions per Hour.	Bore of Connections.	List Price. Ordinary.	List Price. Prepayment.	Stamping Fee Extra.
	C.Ft.	C.Ft.		Ins.	£ s. d.	£ s. d.	s. d.
1	30	0·125	240	⅜	2 11 8	3 15 0	1 0
2	40	0·166	240	⅜	2 18 4	4 1 8	1 0
3	60	0·25	240	½	3 13 4	4 16 8	1 6
4	120	0·5	240	1	5 1 8	6 11 8	1 6
5	210	1·0	210	1¼	9 5 0	11 5 0	2 0
6	420	2·0	210	1¾	16 11 8	..	3 0
7	540	3·0	180	2	21 3 4	..	3 6
8	720	4·0	180	2½	31 5 0	..	4 6
9	900	6·0	150	3	43 10 0	..	5 6
10	1200	8·0	150	3	65 0 0	..	7 0
11	1800	15·0	120	4	107 0 0	..	10 0
12	3000	25·0	120	5	160 0 0	..	16 0

The wedding of Mr. William Higgs and Miss S. J. Wood took place at Christ Church, Palgnton, on the 27th ult. The bride is the sister of the late Mr. Samuel Wood, of Messrs. Wood, Drew, & Co., chartered accountants; and Mr. William Higgs has been for many years Engineer and Secretary to the Basingstoke Gas Company. He has also three sons in the gas industry—Mr. H. C. Higgs, Manager at Basingstoke, Mr. H. G. Higgs, Works Chemist and Assistant at Salisbury, and Mr. J. N. Higgs, the Assistant Manager at Herne Bay.

FUEL FOR MOTOR TRANSPORT.

Power Alcohol.

THERE has been issued by the Fuel Research Board (the Director of which is Sir George Beilby, F.R.S.) of the Department of Scientific and Industrial Research a second memorandum on the subject of fuel for motor transport; and copies are obtainable (price 6d. net) at H.M. Stationery Office, Imperial House, Kingsway, W.C. Sir Frederic Nathan, K.B.E., was appointed Power Alcohol Investigation Officer, under the Fuel Research Board, at the end of 1919, charged with the duty of collecting accurate data from different parts of the Empire as to the possibility of producing alcohol in bulk from local vegetable materials, and of arranging for the continuance of any experiments and negotiations connected with utilization which could usefully be undertaken. An interim memorandum was issued by the Board in July, 1920;* and the present one gives a brief general survey of their work in regard to power alcohol since that date.

The British Empire is responsible for only 2½ to 3 p.ct. of the total world's production of petroleum and its derivatives; and the imports of motor spirit reach enormous figures. As a matter of fact, in 1920 there were imported into the United Kingdom alone 207,739,144 gallons of motor spirit; while for the first ten months of 1921 the imports reached 216,077,424 gallons. Though, of course, the most satisfactory solution of the problem would be for each country to produce its own liquid fuel from indigenous raw materials, it is felt that there are no very hopeful prospects of this being possible in the United Kingdom. Figures are given of the results of experimental growing in 1920 of sugar mangolds and Jerusalem artichokes; and it is remarked that, should these results be confirmed in 1921, the possibility of growing either or both might be considered. Another way in which power alcohol might be produced to a limited extent in this country is by the importation of molasses up to the capacity of the existing distilleries for dealing with it. Consideration is also given to the production of alcohol in the British Dominions and Colonies.

Then there is reference in the memorandum to the synthetic production of alcohol from calcium carbide, and from the ethylene in the coal gas from ordinary gas plant and from coke-oven installations. It is pointed out that the manufacture of calcium carbide requires electricity; and that it can only be made commercially if hydro-electric power or very cheap fuel is available. Demands for calcium carbide, and the price it commands, make it unlikely that it would be available within the Empire in sufficient quantities, and at a sufficiently low price, to make it a raw material for the production of cheap power alcohol. The one possible exception is Australia, where the generation of cheap electricity on a large scale from the brown coal deposits is engaging the attention of the Victorian Government. Canada also produces calcium carbide, the electricity being generated by means of water power; but it appears unlikely that Canadian carbide will be a source of cheap power alcohol. Considerable attention, the Board go on to say, has been given during the last two years to the possibility of removing ethylene from the gas produced in gas-works and coke-ovens, and its subsequent conversion into power alcohol. A manufacturing scale process has not yet, however, been developed; and even should a successful one be worked-out, it would, they say, still be a question whether it would be profitable so to produce alcohol at the expense of the calorific value of the gas.

The important work carried out by the Board in connection with legislation is detailed. The effect of the Finance Acts of the last two years is to free alcohol to be used for power purposes, and incidentally for industrial purposes also, from all duties, except the preferential duty of 2s. 6d. per proof gallon, which will still have to be paid on spirits from foreign countries. Further, the regulations now issued under the powers given by these Acts will enable alcohol for power purposes to be imported and to be handled with the minimum of trouble and expense, and, after it has been denatured and mixed with other liquid fuels in accordance with the regulations, to be sold and used without restriction. In view of these regulations, experiments were carried out at the Fuel Research Station to ascertain the most suitable proportions of the constituents in mixtures of power methylated spirits, National Benzole Company's benzole, and different petrols. The conclusions drawn from these experiments are that not more than 40 p.ct. of petrol, of the brands most commonly met with, can be used to obtain a mixture remaining homogeneous within any reasonable limits of temperature. These proportions at 0° C. are approximately between 20 and 42 p.ct. for the alcohol content; the benzole percentage varying correspondingly between 40 and 18 p.ct.

To sum-up, the prospect is remote of adding materially to the supplies of liquid fuel for internal combustion engines in this country by the manufacture of alcohol from home-grown materials, while the production within the Empire of alcohol from materials containing sugar or starch is only likely to be possible commercially in the near future in some of the Dominions and Colonies, and then only on a sufficient scale to meet local requirements. Synthetic production on a commercial scale in this country is unlikely. It might be possible, however, in Canada and Australia. Research work for a process, either chemical or bacteriological, to produce alcohol commercially from tropical vegetation or waste vegetable materials has not yet reached the stage where its possible industrial application can be practically considered; but the discovery of such a process, where locally applicable, probably offers, the Board say, the best chance of a large-scale production of power alcohol for export.

* See "JOURNAL," Vol. CLI., p. 131.

POSITION OF THE IRON AND STEEL TRADES.

THE more settled political outlook, together with the fact that prices of British iron and steel are likely to find a level at which competition from without need not be so greatly feared, induces Messrs. Bolling and Lowe, Ltd., to regard the prospects, at any rate for the first half of 1922, as brighter than they have been of late. This may well be, for the year which has just drawn to a close has been, to all interested in the iron, steel, and allied trades, the most disappointing and worrying that they remember. Enumerating some of the well-recognized things which have done so much to hamper trade, they remark that to some extent the very serious state of unemployment is due to the crushing expenses connected with doing business, which leave no reserve for extension of enterprise. The Government's export credit scheme (from which so much was expected in the early part of the year) to remedy unemployment, has so far signally failed; while trade has been greatly influenced by the question of exchanges, which have been demoralized. In addition to the fluctuating exchanges, there have been experienced during the year price fluctuations of materials without parallel in the history of the trade.

What these fluctuations have been like, the firm indicate by means of a table contained in their annual review. Thus, pig iron (East Coast), hematite, began 1921 at £13 per ton, and by the middle of December was about £5 2s. 6d.; the drop in foundry quality being from £11 5s. to £5. Copper went from £71 15s. to £67 per ton; and tin from £206 to £171 10s.—with dips on April 1 and Oct. 1 to £157 5s. Lead, which on Jan. 1 was £24 5s., fell in three months to £20 per ton; but from this point there was a recovery to (on Dec. 13) £25 10s. The figures for different descriptions of steel show a heavy decline; the quarterly quotations in all cases furnishing progressive declines. The figures per ton at the commencement of the year, and the reduced values at Dec. 13, 1921, were: Ship plates fell from £24 10s. to £10 10s.; angles, from £24 to £9 10s.; bars, from £25 to £10; joists, from £23 to £9 10s.; and heavy rails, from £22 to £8 10s. Galvanized sheets (24 G.), from a highest figure of £30, came down to £17 per ton. These prices were for iron and steel of British manufacture, but all include delivery f.o.b. British port.

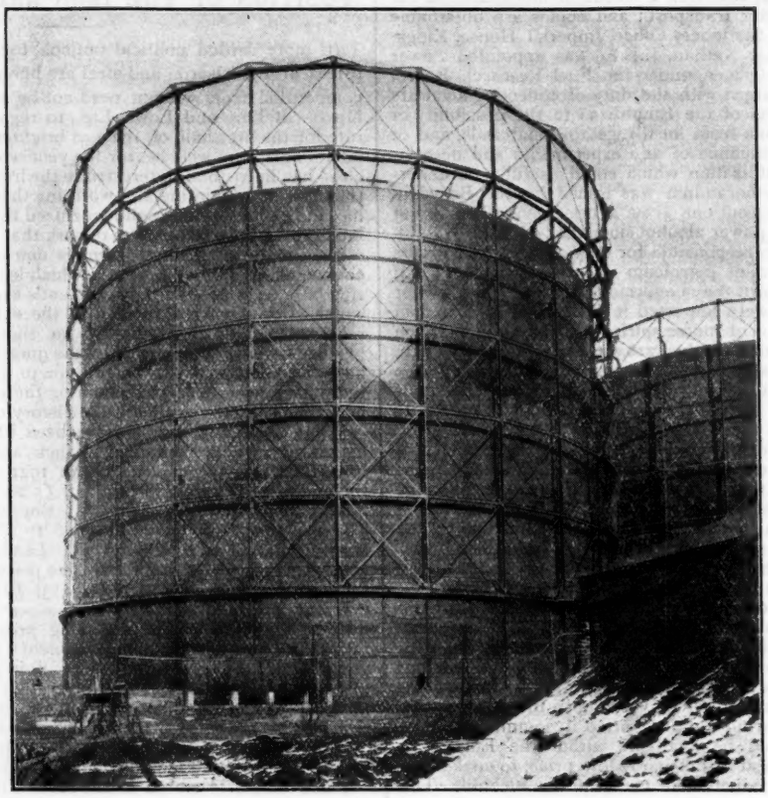
There has, it is stated in the review, been severe competition (with varying success) among Belgium, France, and Germany, to secure business. None of the works has been employed to full capacity. First one country has been selling its limited output for a few months ahead, and then another; so that, taking the past year as a whole, the aggregate tonnage has been very small in proportion to the possible production. The United States, owing to the adverse rate of exchange, did a very insignificant business with this country. Excessive buying in the previous year caused business with India to be much restricted; and until stocks have been cleared, little improvement can be looked for. In the case of Japan, during the last few months business has shown improvement; and important orders for steel plates, bars, &c., have been placed. Buying in all South American countries has been on a smaller scale; while the Dominions and Colonies have felt the full force of the world depression.

Compressed Air for Clearing Gas-Piping.

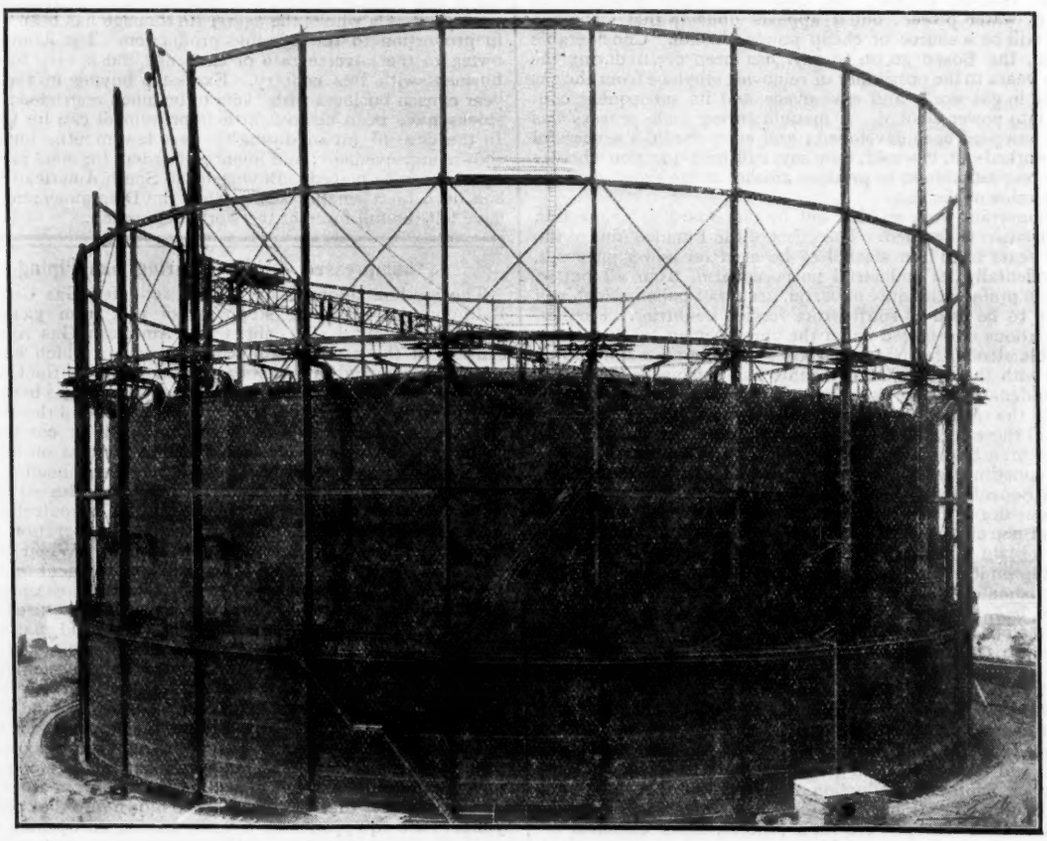
The method adopted by the Consolidated Gas Company of Baltimore for removing stoppages of rust from gas-pipes, as described by Mr. J. T. Griffin to the American Gas Association, consists of the use of highly compressed air, which has proved an inexpensive and satisfactory solution of one of the Company's most aggravating problems. After the stoppage has been located, the meter is disconnected, and a bag is tied round the bottom of the outlet connection. A cylinder containing air compressed to about 1500 lbs. is then connected to the farthest outlet beyond the stoppage; this outlet being created by disconnecting a fixture or appliance. The high-pressure air must be released in a continuous flow, with increasing pressure, which is controlled by the operator. In fact, the success of the whole operation depends upon the manner in which the air is applied. When the air is first released into the piping, it expands, consequent on its being thrown into a larger space, and the pressure decreases considerably. However, as it strikes the stoppage, the pressure builds-up to a point where it will break to pieces any solid matter which may be in its path. There is always the possibility of choking the house-pipe in the event of too great or sudden a charge being given. When such a condition arises, the operator is always warned of its existence, as the air going into the pipe creates a noise, and the action of the air against the stoppage can be noted by him. In the event of the stoppage not being removed, the cylinder is transferred to an outlet in front of the stoppage. In such cases a pipe or hose connection is made from an outlet to a window, in order that the rust may be blown into the open. The cylinders are equipped with a valve having an opening of very small diameter. It is found that the best results are obtained when an additional charge of air is introduced after the stoppage has been removed. This will thoroughly clear the line.

TEN MILLION FEET HOLDER FOR BALTIMORE.

EARLY last year it was stated in the "JOURNAL" that there was under construction for the Consolidated Gas, Electric Light, and Power Company of Baltimore a gasholder which would have a capacity of 10 million c.ft. It is now, we learn, nearing completion, and is expected to be put into commission early this year. In the June issue of the Company's house organ—the "Baltimore



The Ten-Million Holder at Baltimore—Inflated with Air for Testing and Painting, Dec. 6, 1921.



The Ten-Million Holder at Baltimore—Erection of the Guide-Framing, Oct. 29, 1921.

Gas and Electric News"—some particulars were given by the Chief Engineer (Mr. George Beadenkopf) of the work and of the structure, and are reproduced below. They will be studied with interest, together with the accompanying photographs, for which we are indebted to Mr. Beadenkopf.

The holder is at the Company's Spring Gardens Station; and at the time the particulars referred to were published, the work had progressed to the point of assembling and riveting the bottom of the huge steel tank. On Saturday, May 21, the tank bottom was completed; and on the afternoon of that day it was successfully lowered to the concrete foundation on which it rests. This operation was witnessed by a large assemblage of spectators, among whom were Mayor Broening, Mr. Herbert A. Wagner (President), Mr. Charles M. Cohen (Vice-President), Mr. William Schmidt, jun. (Secretary), other officials of the Company, and many prominent citizens. The process of lowering the bottom took 53 minutes.

The tank is 273 ft. 3 in. diameter, covering an area of about 1½ acres of ground, will be 38 ft. 4 in. high, and will contain nearly 16½ million gallons of water when filled; the water weighing about 67,000 tons. The height of the holder when fully inflated will be 237 ft. 3 in. from the bottom of the tank to the top of the spherical crown. The crown, or roof, rises above the rim about 18 ft.

The tank bottom, while being constructed, rested on wooden V-shape supports about 2½ ft. above the concrete foundation, which space admitted of men holding on during the process of rivetting the bottom together. These V-shape supports, or troughs, were placed about 8 ft. apart over the whole bottom. When the bottom was complete and ready to lower, 242 lowering screws were inserted through the 6-in. diameter hand-holes in the bottom; and rested on the concrete base. These screws pass through nuts which are supported by A frames attached to the tank bottom, and supporting it.

After all the lowering screws were in place, and supporting the weight of the entire tank bottom, the wooden V-shaped troughs under the bottom were broken apart and removed. The screws were then used for lowering the tank bottom to its resting-place on the concrete foundation base. After the bottom was lowered, the screws were removed, and the holes in the tank bottom through which they passed were covered with plates bolted to the bottom to make them water-tight. The total weight of the bottom, together with 137 men engaged in lowering it, was about 512 tons.

The total weight of the ironwork of the holder and tank, when completed, will be about 4300 tons; and its cubical content is sufficient to equal that of seven of the largest buildings in Baltimore. The holder tank rests on a concrete slab, 275 ft. diameter, which is 24 in. thick for the width of 12 ft. at the outside rim. The rest of the concrete is 18 in. thick. The maximum weight on the foundation at the outer rim of the holder will be nearly 2 tons per sq. ft., and about 1½ tons per sq. ft. at the intermediate bottom.

In order suitably to locate the holder at the plant, it became necessary to move an 80-ft. diameter oil-tank from its original site to a new site near the oil-dock at the waterfront about 450 ft. away. This was accomplished by first "jacking" the tank out of a pit about 10 ft. deep, and then sliding it on skids across the holder site—making another lift of the tank of about 10 ft. *en route* to its final location.

The holder is the largest of the steel-tank type ever built. There are only three other localities where similar 10-million c.ft. holders have been erected. They are Kingsbridge and Newtown in New York, and Chicago, Illinois. There is a 15-million c.ft. capacity brick-tank holder located at Astoria, New York. This is the largest gasholder in existence. The next in size is a 12½-million c.ft. capacity brick-tank holder at London, England. The 10-million holders referred to come next.

The Bartlett-Hayward Company, of Baltimore, are the Contractors for the holder. One of the accompanying photographs shows the work practically in the final stage.

A Pleno Plant Inspection.—A visit is to be paid next Saturday (Jan. 7), by members of the Manchester and District Junior Gas Association, to the Higginshaw Gas-Works, Oldham, to inspect the "Pleno" plant. Tea at the Town Hall will be followed by an informal discussion on "Low-Grade Gas."

A Coal Manual.—Salesmen, buyers, and users of coal will find much authoritative information in a handy-sized manual written by Mr. F. R. Wadleigh, now head of the Fuel Department of the Bureau of Foreign and Domestic Commerce, at Washington. The publishers are the "National Coal Mining News," of No. 834, Union Trust Building, Cincinnati; and the price is $2·50 in cloth, or $3·50 in leather. The aim of the author has been to supply, as far as possible in an elementary non-technical and practical way, accurate knowledge with regard to the origin, structure, chemistry, and uses of coal. The book is, in other words, not intended for experts on the subject, but for those who lack information which it would be to their benefit to possess. Naturally, a good deal of space is taken up by the discussion of sampling and analysis. Under the heading of uses of coal, mention is made of the fact that the best gas coals of the United States come from Western Pennsylvania, West Virginia, Virginia, and Eastern Kentucky. At the present time, in the States, about 1 p.ct. of the coal output is consumed in illuminating gas plants.

DEHYDRATION OF TAR IN THE LABORATORY.

By WILBERT J. HUFF, Koppers Company Laboratories, Mellon Institute, Pittsburgh.

[A Paper presented to the Division of Industrial and Engineering Chemistry of the American Chemical Society.]

The condensing systems which remove most of the tar from gas generally chill the gas well below its dew-point; consequently raw tar usually contains considerable water. Subsequently, the water content is usually reduced to a few per cent. by gravity separation. But the separation is never complete; and in the case of very viscous tars (such as certain coal tars and tars having a gravity close to that of water, like some water-gas tars), the gravity separation is very unsatisfactory. Some tars retain a very high percentage of water after standing indefinitely. For this reason, tars are generally held to be emulsions. Any tar containing more than a few tenths of a per cent. of water, if heated rapidly, may foam or bump badly. Consequently, the elimination of the water is an extremely important problem for the tar distiller and the chemist engaged in the examination of tars.

For the dehydration of the tar and other organic emulsions, a large number of procedures have been proposed. In general, the laboratory methods involve distillation following the addition of a solvent, or surface evaporation. The removal of water by centrifuging or by electrostatic attraction is not complete; and these methods are, therefore, not generally used in the laboratory. Grinding with carbon black and centrifuging with a solvent permit the rapid estimation of water but present the disadvantage that the tar residue cannot conveniently be used for further study. Methods which involve the addition of a suitable solvent and distillation—such as, for instance, the excellent method of Dean and Stark—do not permit the determination of the light oil on the same portion of the sample, and are generally not used when the chief object is the complete examination of the distillates and pitch.

For such studies resort is had to surface evaporation processes which involve heating the tar from above, usually with a ring-burner. These methods, however, present the disadvantage that the heat is generally not confined to the upper portions of the tar. Consequently many tars froth and spatter disastrously, in spite of the most exacting care on the part of the operator. A current of gas* is sometimes passed through the tar to overcome this disadvantage; but this expedient is not ideal, because the gas current, unless chilled to low temperatures, will carry away uncondensed vapours of water and light oils. Moreover, the mechanical stirring action of the gas stream carries the heat to the lower portions of the still charge, thus assisting in superheating, and the attendant dangers, unless the entire operation is carefully watched. Another expedient involves the slow addition of the tar to the still containing a small quantity of hot dehydrated tar. This is successful with very troublesome tars, but requires attention and special provisions for feeding.

To obviate these disadvantages, the writer has suggested a method now used in the laboratories of the Koppers Company. The tar is placed in the usual laboratory tar-still, connected through the stillhead to the customary condenser and graduated receiver. Before closing the still, the position of the upper surface of the tar is marked. The lower portion of the still is then surrounded with a cylindrical receptacle open at the top—such as a pail—whose diameter is somewhat greater than the diameter of the still. This is so adjusted that the top of the receptacle is a little lower than the tar-level. Water is added to the receptacle until it overflows. Heat is applied directly to the shallow layer of tar exposed above the water-jacket, using the customary ring-burner. This portion of the tar soon attains a temperature above the boiling-point of water; and the steam passes into the hot space above, where it cannot condense without passing out of the still. The water-jacket absorbs heat which would otherwise be transmitted to the lower portions of the tar; consequently these are not heated above the steam point, and no spattering or disastrous frothing can occur. The level of water falls gradually by evaporation, permitting the dehydrating zone to fall slowly. At any one time, the layer of wet tar heated sufficiently to cause steam formation is relatively shallow; consequently the steam has an opportunity to pass off quietly. When the water-level has fallen below the bottom of the still, the tar is practically dehydrated. The receptacle for water is then removed; and the distillation is continued as usual.

The method is so simple that the writer finds it difficult to believe that it has not been used before; if so, he is unaware of its use. It permits the approximate determination of light oil and water on the same portion of the sample; requires no new apparatus, and practically no attention; handles efficiently very stiff tars and tars of high water content; and can be applied with advantage to the laboratory distillation of most tars.

In common with other surface evaporation methods which use direct flame heating, this may be subjected to the criticism that superheating of the vapour space may induce cracking. However, it presents the important advantage that the initial heating takes place at the tar level, when the heat capacity of the tar

* If gas is used, it should be inert. The practice of blowing air through tar should, of course, be avoided, for tar at elevated temperatures may absorb oxygen; and with some tars, the absorption of oxygen is accompanied with a marked diminution in the quantity of recoverable oils.

assists in preventing the attainment of unduly high temperatures. The criticism can be eliminated by jacketing the upper portion of the still with material of high heat capacity. However, under the most unfavourable conditions, the error introduced by such cracking is problematical, and is generally disregarded.

THE FULL UTILIZATION OF BITUMINOUS COAL.

SECOND ARTICLE.*

Manipulation of the Coke-Forming Factors. Material Basis (Examination, Selection, and Mixing of Coals), and Process Factors, and After-Handling.

[COMMUNICATED.]

FOR the sake of simplicity, the previous article only dealt with the two preponderating classes of bitumens, chiefly responsible for coke formation, whether in coke-ovens or gas-retorts operated upon by external heat. Strictly speaking, there is invariably present a third class of bitumen—the degraded product of the nitrogen proteins, and which carries almost the whole of the nitrogen present in the coal. Its amount varies from coal to coal; but its measure is approximately obtained on the basis of the nitrogen percentage. The behaviour of this group *per se* in coke formation is not like that of either of the other two. It has no extreme tendency either towards contraction or expansion, melting or softening, plasticising, or hardening. It is an intermediary group. Its relation to, and bearing upon, the others is, however, enormously important, as, being of an intermediary character, there is the power to weigh the balances in either direction, according as the ratio of the resins to the humus or celluloses is in excess or is deficient of the normal requirements of the coking ratio under the particular operating conditions.

As the quality of blast-furnace coke categorically demands resin sufficiency, and provided retort manipulation (not the case with present systems in adequate measure), it is not injured by a moderate excess of resin. Evidently a cellulosic coal containing a large proteid group is hopeless from the blast-furnace point of view under ordinary retort conditions, and possibly even when full retort manipulation is available—that is, all depends upon whether a sufficiency of resin is present. On the other hand, a resinic excess, accompanied by a large proteid group, can be dealt with by suction and adequate retort manipulation as provided in the Everard-Davies system. With either extreme, intensive heating, accompanied by immediate off-take of the distilled products, is the desirable and only effective remedy.

As the handling of extremes is, however, never readily productive of the best results, let us consider the golden mean in coal composition, and the practicable measures for examination, selection, and mixing of coals with that object in view. The ideal composition of a coal, or mixture of coals, is that in which there is a sufficiency of resinic bodies, preferably of a wide range of melting points; the higher melting thermally stable resins being most valuable—firstly, as to absolute amount, and secondly as to ratio in the total bitumens, such sufficiency value falling with the intensity of the distillation process in its two-fold aspect—heat transmission (rise of charge temperature) and withdrawal of the distillate. The rate of fall is, however, not proportional to either factor.

It is therefore evident how important is the heat control over the process afforded by the particular plant design. Heat control is divided into at least five sections. (1) External flame temperature. (2) External heat transmission or conductivity. (3) Degree of internal heating (if any) adopted in conjunction. (4) Rate of convection. (5) Composition of internal heating medium. Variations in each and all of these respects give rise to ample latitude for manipulation to meet any resinic ratio (including high, medium, or low melting resins).

1. MATERIAL BASIS.

A.—Examination.—The examination of coals as to their composition and structure comprises ultimate and proximate analysis, microscopic examinations, solvent action, progressive carbonization at first low and then medium heats, thermal and chemical data being collected at separate stages, and extraction of the complexes in the coal by melting out in an inert heating medium.

(*a*) *Ultimate Analyses.*—The percentage of C, H, O, N (and S) in a coal or coal mixture is useful, in so far as approximately a check can be placed upon results obtained from the succeeding tests as to the ratio of resin, humus, and proteid groups present. The resins increase the C : H ratio, the cellulose the O_2, and the proteid the N_2 and S contents. If the oxygen content exceeds 4 to 5 p.ct., the coal is almost certain to contain large humic ingredients, the amount increasing with the O_2. Peat and lignite celluloses contain approximately C = 65 p.ct. H_2 = 4 p.ct. O_2 = 31 p.ct.; but those in coal have suffered bacterial degradation, so that the O_2 has been reduced to 15 to 20 p.ct., whereas the C has been increased. [Anthracitization.] Cellulosic coals having 12 p.ct. O_2 on the total coal therefore represent about the maximum limit along this extreme. The O_2 content of a coal is likewise increasable by the presence of the nitrogen group in quantity. In the original proteins the O_2 amounts to 19 to 24 p.ct., but in the charged actual coal 10 to 15 p.ct. Taking the latter basis, together with the N_2 value, it can be fairly well determined what amount of proteid derivatives are present; and the celluloses can then be estimated within limits on the basis of the residual O_2. A 5 to 10 p.ct. error does not vitiate the utility of this method of check on the following methods.

The composition of the resins is approximately C = 86 p.ct. H_2 = 8 p.ct. O_2 = 6 p.ct. The O_2 hardly ever exceeds 10 p.ct.; the resins are the most preserved of all the coal ingredients. This is truly confirmed both chemically and microscopically. On the other hand, the variety of resins is far greater than that of humus or celluloses. "The term resin includes a large number of complex substances of widely different chemical types, difficult to classify properly. They generally soften at temperatures much below their melting points, which are rather indefinite, and so exhibit in a marked degree the phenomenon of superfusion.—Prof. Bone's 'Coal and its Scientific Uses.'"

(*b*) *Proximate Analyses.*—The volatile matter and the kind of coke yielded, particularly if of a silvery lustre and hard, are all clues to the resin and cellulose ratios. A lustrous hard coke shows large resinic content, a powdery coke almost absence thereof, and a weak black coke insufficiency.

(*c*) *Microscopic Examination in Thin Sections.*—(See work of Lomax and Knox). This method has the advantages of simplicity and directness, for it is thereby possible actually to see the resins, humus, sulphur and nitrogen groups, and carbon residue in the coal matrix, and to some extent to estimate the ratios. It is always possible to tell along which extreme and upon what balance a coal is.

(*d*) *Solvent Action.*—Benzene, toluene, alcohol, and chloroform, if treated so as to improve and accelerate their solvent action upon the coal complexes of a soluble character, are capable of isolating the resin constituents without radical alteration. For example, a mixture of amyl alcohol and pyridine has been found more effective than either ingredient separately in removal of unaltered resinic constituents. The working out of a practical formula or formulæ will be later dealt with.

(*e*) *Progressive Carbonization.*—The subjection of coal to a low heat but with increasing temperature until completely carbonized, and doing so at various rates, together with the collection of the distillate yields separately in stages, is another indirect, but valuable, method of fathoming the composition. The distillation of coal inevitably involves transformation into liquid and gaseous states of part of the solid coal substance, which can alone be done by decomposition, so that the actual substances present in the coal cannot by such a method be isolated. The nearness of the products issuing by carbonization to the coal substances themselves depends chiefly upon the boiling and decomposition points of the oils and gases liberated. The lower these the nearer the relationship, and *vice versa*. A secondary factor, but one of equal practical importance, is the ratio of the rate of penetration of carbonizing to the rate of fall of temperature across the outlet path to the distillate. It is advisable to increase the latter to the maximum possible degree consistent with increases in the former; but this is only possible with the mode of withdrawal embodied in the Everard-Davies system.

In the decomposition of the coal substance by heat, the tendency is to isolation of, firstly, liquid products, then gases of high specific gravity, and then gases of low specific gravity. This is determined by the decomposition points and the disturbance thereat of the balance of the composition of the constantly changing residue by the temperature and the atmosphere, with a probable relative importance for each in the order named. The higher the thermal stability of the resins, the harder coke is possible; but a wide range of resins is also desirable.

The primary decomposition of the coal substance begins at 200° C. (or thereabouts), with an elimination of water and CO and CO_2. This is the result of the decomposition of the less altered celluloses, and continues up to, and probably beyond, 450° C. At 350° C., or thereabouts, a point is reached at which the evolution of gases, principally hydrocarbons (of the C_nH_{2n+2} and C_nH_{2n} series), becomes pronounced. The less altered cellulosic derivatives decompose more easily than the more altered derivatives, and also more easily than the resinous derivatives. The cellulosic derivatives decompose so as to yield H_2O, CO_2, CO, and hydrocarbons, giving less of the first three products the more altered they are. The resinous derivatives, on the other hand, decompose on moderate heating so as to yield principally the hydrocarbons, with probably H_2 as a direct decomposition product. The more mature bituminous coals, having good caking properties, containing a large resinous content with highly altered cellulosic ingredients, are therefore free of high H_2O CO_2 yields as first decomposition products. It is therefore naturally detrimental to load a charge with moisture, particularly if the coal is excessively humic or resin deficient.

The unsaturated hydrocarbons almost all pass over below 600° C., and disappear entirely at higher temperatures. Methane and other hydrocarbons (paraffins) form from 60 to 80 p.ct. of the whole gas up to 800° C., after which they decrease rapidly with further rise in temperature. Between 800° to 1000° C. hydrogen predominates, but in turn diminishes above 1000° C. Very high temperatures promote the formation of CO.

It has been suggested that the critical temperature of 700° to 800° C., at which the evolution of H_2 rapidly increases, has been proved to be due to decomposition of the stabler of the two main groups; but this is not probably quite true. From the heat treatment of coals at a low temperature it should be abundantly evident that both resin and celluloses, and even proteids, can in bulk

* The first article appeared in the "JOURNAL" for Dec. 7, p. 686.

be extracted below 700° C. The truth probably is that the resultant semi-decomposed products of all three groups yield-up hydrogen at this temperature in the main, but particularly the altered cellulosic ingredients and the proteids. It is even probable that after 850° C. whatever CH_4 can remain stable is secondarily formed as the result of a H_2 and CO (or CO_2) reaction of a reversible character.

The olefines apparently are the low-temperature decomposition products of the less altered proteid groups and the low melting resins; the oils being in the main the first products of altered celluloses and proteins, whereas methane issues as the temperature rises as a result of resinic, proteid, and cellulosic decomposition following the points at which the olefines are no longer stable, and also whereat the proportions of available C : H in the decomposing mass are nearer methane than the olefines. Some of the H_2 accompanying the methane issues as a "leave" or offshoot balance as the result of temperature and atmospheric effects upon decomposition. High-temperature resinic (the more stable resins) decomposition almost alone is responsible, however, for the methane produced at temperatures of 700° and more, and lustrous coke is the direct consequence of the cracking of the major part of such methane into C and H. The hydrogen produced below 600° to 700° C. is chiefly the result of the last decompositions of the cellulosic and proteid groups, but partly also of resinic decompositions (the less stable resins).

The resultant semi-decomposed residues then suddenly commence yielding up hydrogen from 700° to 800° again in the order of cellulose, protein, and resin as the temperature rises. The truth of this statement is borne out by the formation at 600° to 800° C. of as hard and dense and porous a coke quite suitable for furnace requirements as that produced at higher temperatures, showing that the real work of coke formation does not necessitate high heats except in so far as increased thermal conductivity and graphiting play parts. The proteids and resins can function at these temperatures in their decomposition and coke-forming effects producing CH_4 and ethane, &c., at higher temperatures than the celluloses can, and so that graphiting ensues as a result of exposure. This does not dispute the beneficial effects of rapidly increasing the temperature in order to increase such graphiting effects when the caking quality is none too good and such procedure is warranted. It is, however, necessary quickly to discharge once the volatile matter is completely-distilled-off under these conditions.

From the above it should now be evident why the ratio of resin to cellulose is so determining a factor in coke formation. If, as is nearer the truth, the ease with which decomposition sets in under increasing temperature varies more or less inversely for the two classes of bitumens, then it is clear why the absence of, or insufficiency of, resin results in no satisfactory coke, and why, by varying the carbonizing conditions, some non-caking coals yield good coke. This is due to such variations resulting in earlier cellulosic decompositions and retarded concentrated resinic graphiting as a result, or to drawing off of the celluloses so completely that the resins remaining can operate more effectually. It is for this reason that retardation of the coking process as at present inevitable vitiates the formation of the best coke, as thereby celluloses of an altered type remain over, and a great deal of the resins have escaped owing to the atmosphere obtaining during the early stages (no escape for H_2O, CO_2, and CO, &c.), facilitating resinic extractions without any coking effect therefor. This is why speedy heating and withdrawal are handmaids in the process. Exudation of the resins is also promoted by wet charges and slow carbonizing, but with great detriment to the process of coke making.

(*f*) *Extraction of Resins by Inert Heating Medium.*—It has been found that if coal be heated by a current of CO_2 (and/or N_2) at a low heat (to prevent interaction), the low melting resins can be exuded. The high melting resins cannot, however, be extracted by this means. This method seems a useful way of separating the resins otherwise obtained more or less *in toto* from coal by solvent action.

B.—Selection and Mixing.—Coals of extreme composition respecting volatile contents should be brought within the range of 20 to 30 p.ct. Choice should provide that the resultant resin is 5 to 10 p.ct. more than the minimum for yielding a sufficiently good coke under the standardized retorting conditions; moisture and ash should be minimized so far as practicable; the coals should be thoroughly mixed in a state preferably between 3 in. and ⅛ in., before crushing.

2. Process Factors.

Some of these have inevitably cropped-up under the previous heads. The process factors comprise heat and pressure control, atmospheric variations and control, the type of distillate and its amount and temperature release, the form and the state of the charge. The manner in which heat control can be varied has been indicated in the opening passages. The incidence of the heating effect is, of course, largely dependent as to its coking effect upon the thickness of the charge across which the heat and the distillate must pass. Therefore the quantity of resin present requires to be set to a definite incidence and rate of heating. The use of pressure is more important on the bye-product side than on the coking, once the minimum suction for rapid and easy removal of the distillate issuing from cellulosic decomposition is present. Large celled coke is prevented by increase of suction. Suction densifies the coke.

Atmospheric control can be exercised to incite decomposition of the celluloses and to delay that of the resins—a very useful procedure if coals are deficient in resin. Carburetting with hydrocarbons also realizes the latter. Oxygenation at charge temperatures between 400 to 700° C. is also inducive to resin synthesis. Atmospheric control should, of course, be strictly guided in conjunction with the nature of distillate issuing at any given temperature.

The form of charge is important in determining the conductivity and incidence of heating temperature (of the flues and internal heating medium if embodied) required in relation to the other factors. The state of the charge is also important. Dry charges require slower first heating, followed by more rapid, whereas *vice versa* with wet charges, which should be avoided. With selection of coals as above compression is unnecessary, and certainly undesirable. It is quite admitted, however, that the compressed charge has been a necessity in certain localities when retorting on previous systems. But the necessity is entirely relative to the retort design and coal volatile. The subdivision of the coal is desirable to the extent of reducing it below ½ in., but hardly to ⅛ in. and less when using suction.

The function of resin is therefore dual—*i.e.*, physical and chemical—physical in preventing undue softening because of the richness of carbon therein, and chemical in depositing graphite at a high heat exceeding 700° C. The function of suction is counteractive against the cellulosic tendency to softening, and also ensures withdrawal of the gases resulting from early cellulosic decomposition, so as to leave the coal with an ever increasing or maintained ratio of resin to other groups as the temperature increases. It also densifies the coke by dividing up the resin globules, and thus making smaller pores. It is true that the ratio of resin and celluloses, &c., may be quite within the required blend for good coking, but that the absolute amounts are more than necessary—*i.e.*, there is excess of a balanced volatile matter, in which case a good coke is more than assured, and a margin remains for bye-product operations by consumption (say) of 6 to 15 p.ct. (or even more in gas practice) of the normal coke yield.

On such coals as these the writer's work enables him to say that the old-established intermittent method of working retorts could be displaced in favour of a continuous method with mechanical charging and discharging. In support of this, he would refer to the relatively high grade coke now made in verticals, even under steaming conditions, considering the state in which it is usually charged and the retort limitations. You have but to remove sticking troubles, to reduce the coal to a greater fineness, and to cut-off or reduce steaming and adapt the retort to passing through a charge with moderate side-wall pressure under a greater top pressure, to realize this.

When a coal contains excess cellulose and is retorted under present systems, all the conditions—slowing-down the distillation—tend to prevent the excess from "blowing-off" and thus leaving a higher "resinic" ratio as the process proceeds, so that a weak coke issues, whereas in the Everard-Davies system the reverse is the case. The ordinary effect of excessive humus in yielding poorly graphited or weak coke is thereby prevented, as, instead of the celluloses being imprisoned by the resin and exposing the latter too early in the process, they are rapidly withdrawn. The secret of improved carbonization is therefore best expressed in a word—"intensification"—with control of heat. suction, &c.

It is generally acknowledged that the ideal blast-furnace coke is of a medium-celled or fairly small celled, hard, porous, dense compact, well graphited order. This being so, the process conditions of our system facilitate and realize such coke-making on the minimum possible bitumens, so as to extend the area of caking coals over coals of from 16 to 40 p.ct. volatile matter (with mixing), apart from affording means for making any class of coke or semi-coke given facilities for varying all factors.

3. Coke Handling.

In present coke-oven practice, ram discharge is the general method of evacuation. Unless the volatile in the coal is above 23 p.ct., and resin is not excessive, it is not easy to operate ovens without great care in this respect and prevent damage to both side walls and coke. In many cases is the ram responsible for considerable destruction of the battery by wear and tear, and for coke crushing.

In gas practice, likewise, where cutting devices are used for extracting from verticals, the same coke destruction ensues, and the same wear and tear in the operating mechanism. This is removed in the first case by bare gravitational intermittent discharge through a dropping or swinging door; and in the second, by using an extractor with no cutting device, but which simply rests under the load of the charge and removes the coke immediately over it into a chamber beneath. By this simple direct method there is no crushing effect, and, further, different cokes can be variously handled.

A further advantage of either of the above modes of discharge beneath a vertical retort consists in the annulment of any labour handling until the coke is in the bogey ready to be transported to the point of use or destiny. Also quenching of the coke with hot water, or wet steam, with either withdrawal of the steam from the quenching chamber or with passage thereof upwards through the retort, can be most efficiently executed without intermediary loading or handling when gravitational discharge from a vertical oven or retort is possible. In intermittent coke-oven work, steam of good pressure value should be recoverable in quantity when thus operating on a number of large charges; whereas with con-

tinuous gas making a large part of the steaming requirements of the retort can thus be obtained. In both cases not only is there steam economy, but a coke of the best appearance, and in an almost undeteriorating condition, from the retort is deliverable.

In concluding this part of the subject, the writer wishes to tender acknowledgment and thanks to all previous and present workers in the various fields of research and experiment drawn upon to no inconsiderable degree in arriving at the above synthesis, either for purposes of actual construction or corroboration. The personal equation has been overlooked by reason of the limitations inevitable in its introduction, but not in forgetfulness of the necessary services thus rendered. The pure truth stands out better unadorned always, although it is difficult to invariably obey this rule. Further, it is only too frequently necessary to realize the limitations of isolated "factors," true enough to specific sets of conditions, but modifiable under others, and therefore incapable of generalization broadly. In the above synthesis, the relation of factor to factor and to the whole process has been borne constantly in mind.

RECUPERATION AND CONSERVATION.

A Paris Exhibition.

In March last year there was held in Paris an exhibition of appliances for heat-conservation purposes. This was a great success; and the Office Central de Chauffe Rationnelle has decided, says the "Journal des Usines à Gaz," to organize a similar exhibition of apparatus applicable to industrial heating. This will take place in April, at the headquarters of the organization, No. 5, Rue Michel-Ange, Paris (XVIe).

As before, the exhibition will be confined to appliances of a very definite category. As complete a show as possible is attained by such limitation; and engineers are enabled to present to the public the actual state of development of heat economy. The exhibits will be divided in two sections: Heat conservation—conductors, refractories, and insulators; and heat recuperation—recuperators and regenerators, economizers, &c. All facilities will be provided to enable firms to carry out demonstrations for the benefit of visitors.

The Society for the Promotion of National Industries and the Society of Civil Engineers have again consented to accord the exhibition their patronage. Intending exhibitors should get into touch at once with the Office Central de Chauffe Rationnelle, at the address given above.

Regular Meter Reading.

With a view to eliminating what has been found to be one of the greatest difficulties of their gas and electric meter readers—that of being unable to gain admittance to premises—the Philadelphia Company have organized a system for, as far as possible, reading customers' meters on the same day of each month. During last March, a schedule was worked out for the months of April and May, establishing a definite date upon which each meter would be read—though these dates must be subject to variation through intervention of Sundays and holidays. Every month a meter-reading schedule is prepared on each reader's route, a copy of which is in possession of the reader at all times, in order that he may advise the consumer when the meter will be read during the succeeding month. This information is also available from the general office of the Company, and can be communicated to consumers when desired. If the meter reader fails to gain admittance to a customer's premises, a notification is left by him. If the meter reader fails to gain admittance on his second monthly visit to these same premises, a report is made to the general office, and a request is sent to the customer asking for co-operation to the extent of making arrangements whereby the meter reader may be admitted monthly. In each of the above instances the customer is furnished with a dial form for both gas and electric meters, and instructions for the reading of both kinds of meters. This affords the consumer the opportunity of marking the dials and forwarding same to the Company's office, where the readings are accepted for three months in succession, and each time a bill is prepared and sent in; the usual amount of time being given for the payment of same. If a meter reader is not admitted three months in succession, a special report is made to the general office; and these cases are handled by personal calls on the patrons. A reading of the meter is thus procured, and arrangements made at that time for monthly readings in future.

The widespread belief that British tube-making plants are out of date is, says the "Ironmonger," not well founded. There are plants in this country that represent the last word in scientific tube-drawing practice; and their number has now been augmented by the opening of the New Crown Tube Works at Wednesbury, belonging to Messrs. James Russell & Sons, Ltd. Only one section of the works is in operation at the moment; but another is rapidly approaching completion. The furnaces are all of the gas-fired type.

THE RAPID AND ECONOMICAL MAINTENANCE OF GAS PLANT.

By C. W. BRETT, Managing Director of Barimar, Ltd.

To the gas industry, perhaps more than to any other, the question of efficient repair is one of supreme importance, not only because gas production involves the employment of a large and expensive mechanical equipment, but because a breakdown is attended with serious consequences, not the least of which is the cutting-off, or the temporary reduction, of the public gas supply. There is also another aspect of the case, which concerns more particularly the necessary annual outlay required to keep plant and machinery in constant commission—"necessary," because many directors of production sanction without question expenditure that, in reality, is not justified. In such cases it is, of course, usually the method of upkeep that is at fault.

Now, strictly speaking, mechanical maintenance can only be effected in one of two ways: By replacement, and by one or other of the processes embraced in the term "scientific welding." The former, unfortunately, has many disadvantages, among which must be cited its expense, its inadequacy, and its time-wasting character. In point of fact, replacement is not a repair at all, but the purchase or part-purchase of a new whole. A repair entails the treatment of the original fabric in such a manner as shall restore it to its pristine condition. Again, replacement does nothing to re-create the whole unit. If a worn component breaks, and is replaced, nothing has been done to improve the condition of all the other members which also exhibit evidences of wear, though they may not have reached the actual breaking point. These remaining parts, therefore, represent so many sources of future trouble. Another objection to replacement lies in the association of new and old components—a state of things which too often is very unsatisfactory. But, of course, the all-important matter is cost and the rapidity with which the machine can be rehabilitated, so as to yield 100 p.ct. efficiency.

It is here that the contrast between replacement and welding is most pronounced. Scientific welding is rapid in application, economical in cost, efficient in effect, and permanent in character. Taking an average charge for the repair of the following units (which, by the way, are included in the ordinary routine of welding), the saving effected is well over 50 p.ct., and sometimes it is as high as 75 p.ct.: Power units of all descriptions, mechanical stokers, boilers, furnace fittings, boosters, rotary gas-blowers, exhausters, steam turbines, fans, tar-stills, charging machines, gasholders, trusses, frames, conveyors, weighers and weigh-bridges, elevators, cast-iron meters, coke-ovens, horizontal and vertical retorts, condensers, compressors, radiators, crucibles, mains, sleeves, filters, washers, tanks, hydrogen plant, sulphate plant, scrubbers, pipe-bending and cutting machines, all types of inter-departmental and road transport, &c.

But while claims made on behalf of welding are very sweeping, it is only possible to substantiate these claims when the work is in the hands of specially trained and experienced operators, acting under the direction of a metallurgical expert, who has made his special study the high-temperature treatment of industrial metals. Added to this, it is necessary to have laboratories and workshops fitted with every requisite for the employment of any of the half-dozen processes commonly used.

Welding is an exceedingly scientific and highly technical subject which most assuredly cannot be easily acquired by the ingenious amateur. More harm can be done to valuable machinery in half-an-hour by an incompetent welder than can be put right in a fortnight (if at all) by a specialist. If, therefore, the question of economy and efficiency in connection with the repair and maintenance of gas plant is considered, the all-important thing is to see that the work is entrusted to experts, who, in 90 p.ct. of cases, are willing to guarantee the reconstruction.

Storm Damage at Rotherham Gas-Works.—During the gale on Monday morning, serious damage was done to the Rotherham Corporation Gas-Works in Frederick Street. The roof of the old retort-house was completely lifted, and the place practically wrecked. This building was the oldest part of the undertaking, and was out of use, except for coal-storage purposes. The Rotherham service has not been affected in the slightest degree by the occurrence.

Higher Oil Prices in America.—During the proceedings at the annual meeting in Chicago of the American Petroleum Institute, Mr. Frank Haskell (who is President of the Tidal Oil Company) declared that crude oil will cost more in the future than it has done in the past. It is, he said, extremely improbable that the amount needed in the next ten years can be supplied at any such average prices as have prevailed during the last ten years; but that the oil will be forthcoming, if a price high enough to afford a fair margin of profit is paid, is not to be doubted. Higher labour and material costs will contribute to bringing about higher prices for the crude oil; but the principal causes of increased prices will be the necessity of drilling to deeper producing strata in fields now under development, and the greatly enhanced cost of transportation of material into, and oil out of, regions more remote, which are now being opened, and which will in the future furnish a large and ever-growing percentage of the world's supply of petroleum.

NEW SOUTH WALES AND QUEENSLAND GAS INSTITUTE.

Mr. H. Tindale's Presidential Address.

The Institute held their Annual General Meeting in the Highland Society's Rooms, Phillip Street, Sydney, on Tuesday, Oct. 25, under the presidency of Mr. H. TINDALE.

In their seventh annual report, the Council stated that the total number of members on the roll was 61. They regretted that it had been impossible to obtain any papers for the meeting, and proposed instead to have a discussion on the Presidential Address. On the day following the meeting, there was a combined motor and steamboat excursion.

The following are the office-bearers for 1921-22:

President.—Mr. H. Tindale.
Vice-President.—Mr. S. J. Janes.
Hon. Treasurer.—Mr. A. H. Smedley.
Hon. Secretary.—Mr. T. F. Waugh.
Members of Council.—Messrs. C. U. B. Gurnett, E. Foster, and E. Tucksworth.

PRESIDENTIAL ADDRESS.

Mr. H. TINDALE's lengthy Presidential Address was accompanied by numerous diagrams, photographs, and tables. Having first dealt with local industrial features of the past year, and their bearings upon the gas industry, he referred to the benefits to be anticipated from the English Gas Regulation Act, and to the remarkable thoroughness, energy, and thought that have been brought to bear on the problem of fuel conservation in England. In Australia, on the other hand, he went on to say, no serious thought has been given to the problem of the conservation of coal resources. So far as he is aware, no estimates have been prepared concerning the probable life of their coal measures. Judging by the rate of present demand, they appear to be inexhaustible; but no one can honestly contend that the subject should not be given earnest consideration at present.

Probably one of the reasons why the Australian gas industry has not made any effort to investigate the coal resources for gas-making purposes is the want of inducement brought about by conditions laid down under various Gas Acts. It has always been known that the Newcastle and Maitland coalfields were the only two worth considering for the majority of works. Nature had been particularly lavish in placing at disposal, in these fields, what are probably the richest coals in the world. The thickness of these seams is not measured in inches, but in feet; several being 15 to 20 ft. thick. These coals, on being carbonized, easily yield a rich gas which can be made to conform to the requirements of the various Acts, without needing any serious research or experiment. One is apt, therefore, to leave well alone. But the need for research will be more pronounced should an Act framed on the lines of the English Gas Regulation Act be brought into force. There will then be more scope, more inducement to exploit coal from seams nearer the respective works—coals hitherto deemed impracticable owing to the lack of suitable illuminants in the gas produced.

A SUGGESTED RESEARCH STATION.

The subject of coal investigation opens-up the question of the possibility of a research station in connection with the Australian gas industry. In order to justify this question, he had collected the following information from the latest published statistics.

Gas and Coke Works in 1918—Exclusive of Tasmania and Western Australia.

Number of factories	134
Approximate value of plant and machinery	£5,000,607
Value of raw material used	£1,424,872
Coal used	1,494,102 tons.

The figures for 1921 are, of course, much greater; the quantity of coal carbonized being probably 2,000,000 tons per annum, while the value of plant and machinery is perhaps £6,000,000. It will thus be realized that the gas industry in Australia is one of fair importance, and the capital involved sufficiently large to warrant the earnest consideration of more extended research. While it is, of course, obvious that a station of the magnitude of that of the Fuel Research Board in London could not be entertained in Australia, it is suggested that a more systematic and co-operative scheme of research, on matters relating to the gas industry, could be undertaken.

One method of conducting investigations would be through a Special Committee appointed to inquire into, and report on, any specified subject selected for investigation. This Committee should have the privilege of enlisting the help of all members, who could be asked to collect data at the works under their control. By such means, co-operation would be obtained; and the reports presented from time to time would be of great value. It is not desirable that one company, however large it may be, should undertake the whole of any investigations at its own cost. Since any research—for instance, on the carbonization of coal under modern conditions—would be of extreme importance to the Australasian gas industry, such research should be undertaken and financed by contributions made by Australasian gas and bye-product works.

Concerning a research station, he suggested that an experimental plant be erected at one of the larger works, or, as an alternative, that certain benches be isolated and connected to a small purification and measuring plant. The cost of installation and operation should be shared, in a suitable manner, by all the undertakings desirous of reaping the benefits which accrue from such a research station. Many of the problems relating to the gas industry could thus be investigated under local conditions. The research need not be confined to the carbonization of coal, but could, with advantage, be extended to investigations on local fireclays, washing and purification of gas, corrosion of service-pipes and meters, or even new fields for the bye-products of coal. The station could possibly defray some of its expenses by undertaking chemical analysis and investigations, at pre-arranged fees, on material used by small gas-works at present unable to afford full chemical supervision.

GRADING OF COAL.

Coal is now carbonized in New South Wales in horizontal, inclined, and vertical retorts, and in coke-ovens. It might be of interest to compare the results obtained from horizontal and vertical retorts on the Glover-West system, using the same class of coal.

The No. 1 retort-house at the Mortlake works of the Australian Gas Light Company has recently been reconstructed. The old beds of nine have been replaced with beds of ten horizontal retorts, 24 in. by 18 in. cross section by 22 ft. long, with an ascension pipe at one end. This house now consists of two sections of twelve benches, each containing ten retorts, five tiers high. The stoking is done by a Fiddes-Aldridge simultaneous charging-discharging machine; and the coke is removed by a hot-coke conveyor of the De Brouwer type. The whole of the fireclay and silica material used throughout the benches, the retort-bench fittings, the hot-coke conveyor, and most of the steelwork were entirely manufactured in Australia. The average charge is 13·5 cwt. of coal, which is carbonized in twelve hours. The machine is very smooth in its operations. The coke is pushed out with ease, and the charge of coal laid in an even manner. The heating of the setting is very uniform; a temperature of 2200° Fahr. in the combustion chambers being maintained. The results obtained from Australian-made fireclay goods have certainly exceeded expectations, and fully justify their more extended use in gas-works. It has now been proved, beyond doubt, that it is no longer necessary to import such material from Britain.

The quality of gas made in these horizontals is remarkable; the gross heating value being between 600 and 700 B.Th.U. The make per ton cannot be definitely ascertained; but there are good reasons for believing it ranges between 12,000 and 12,800 c.ft. There is thus a yield of 76 to 84 therms per ton. In vertical retorts, the same coal would yield, with minimum steaming, 13,000 c.ft. of 580 to 600 gross B.Th.U. gas; being a yield of over 75 therms per ton. It is interesting to compare these results with those obtained in England, as shown in the attached table.

—		English.	Australian (Maitland Coal).	Remarks.
Therms, per ton (straight coal gas)	Hor.	65—70	75—84	Minimum steaming in vertical retorts—*i.e.*, steam used equal to less than 5 p.ct. by weight of the coal carbonized.
	Ver.	55—80	72—78	
Tar, gallons per ton	Hor.	9—12	10—12	
	Ver.	8—13	15—20	
Sulphate, lbs. per ton	Hor.	16—28	25—28	
	Ver.	16—30	23—28	
Coke, cwts. per ton	Hor.	12—14	11—12	
	Ver.	12—14	11—12	

LARGE AND SMALL COAL.

The percentage of large and small coal present in the charge plays an important part in gas making. By small coal is meant that portion passing through a $\frac{7}{16}$-in. screen; while large or best coal is that portion retained on the same size screen. It is, of course, well known that less gas is made from a ton of small coal than from one of large, and, in addition, that the heats in a horizontal bench are very much upset through the carbonization of small coal.

In a vertical retort bench, the effect of small coal is also detrimental. When carbonizing such coal, the tonnage throughput is much reduced; and in installations such as that at Mortlake, the throughput may vary, within two or three days, from 720 tons per day with large coal to 640 tons with small. Such variations in the quantities of coal carbonized make the regulation of gas stocks a most difficult matter, particularly in the winter time. During the course of the last twelve months, the daily throughput of coal has been compared with the percentage of large and small coal carbonized and the weight per cubic foot of crushed coal supplied to the retorts. The data collected have been set out in a suitable form in the accompanying Diagram No. 1. It will be noticed that, as the weight of coal per cubic foot increases—*i.e.*, an increase in the percentage of small coal present in the mixture—the throughput decreases in the order, approximately, of 2 p.ct. decrease in throughput for every 1 p.ct. increase in the weight per cubic foot of coal used. The heating surface and the quantity of heat sup-

plied to the bench, in the form of producer gas, were practically constant throughout.

The determination of the most economical carbonizing mixture of large and small coal is therefore of prime importance, because large coal is dearer than small coal. In an installation working at full capacity, though the output may vary (depending upon the grading of coal carbonized), the interest and depreciation charges upon capital, the labour required in carbonizing, and the repairs and maintenance are all practically constant. On the other hand, the yield of gas per ton of coal varies, being greater in the case of large coal. Diagram No. 2 gives the results of carbonizing in vertical retorts various combinations of large and small coal, when allowance is made for all the factors enumerated. The total yield of gas has here been determined on the basis of 13,000 c.ft. per ton for large coal, and 12,000 c.ft. per ton for small. The results show that there is practically no difference in the cost per 1000 c.ft. of gas made. However, since the total quantity of gas made per installation is greater with large coal, it follows that in practice the tendency should be to carbonize large coal in vertical retorts.

In a horizontal setting, the time factor and its influence on carbonization are not so easy of control as in a vertical setting. A certain cycle of operations having been arranged, the coke in the retort is pushed-out, whether fully carbonized or not, at predetermined periods, with the result that varying amounts of volatile matter are retained in the coke. With the "F.A." machine, since a certain volume of coal is placed in each retort, the total weight of coal carbonized is dependent upon the weight per cubic

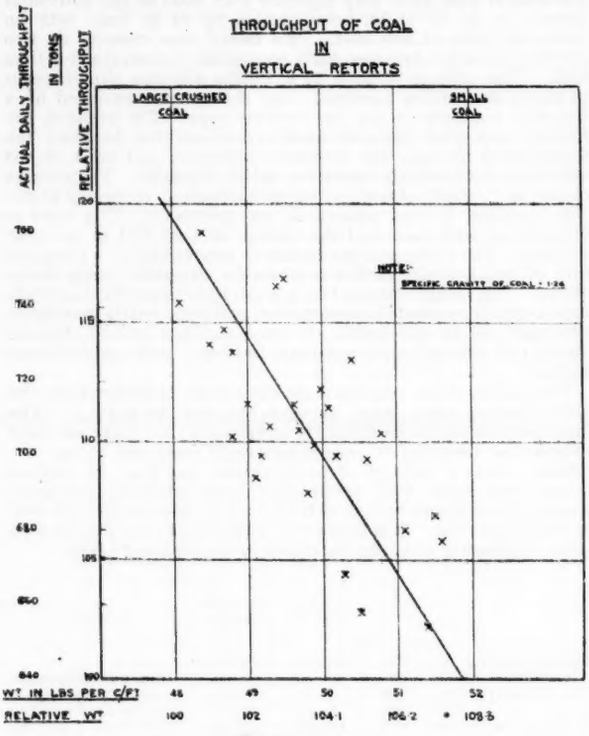


Diagram No. 1.

foot of the crushed coal used. A charge of 30 c.ft. of crushed large coal equalling 13 cwt. is easily carbonized in twelve hours; but the same volume of small coal weighing 14·5 cwt. is not only far from carbonized in this time, but the additional weight necessitates extra heat which, unless provided by increased producer gas, is robbed from that stored-up in the brickwork, resulting in a drop in temperature of 100° to 150° C. The whole of the heat conditions of the bench are thus much upset. In Diagram No. 3 the most economical combination of large and small coal has been set out for horizontal retorts, on the assumption that the charges for interest and depreciation on the capital used, the cost of labour required in carbonizing, and that of repairs and maintenance are constant throughout. The cycle of charging and discharging has been kept constant, but the yield of gas per ton of mixed coal has been computed on the basis of 13,000 c.ft. per ton for large coal, and 11,000 c.ft. for small.

A most important factor, under practical working conditions, is minimum variations in the weight of coal per unit volume. While benches can be easily regulated to meet any one permanent set of conditions, daily variations in the grading of the coal used are most difficult to cope with, and result in reduced efficiency.

RECOVERY OF AMMONIA.

The recovery of ammonia from crude gas under Australian conditions is a subject full of practical difficulties, particularly during the summer season. The method of recovering this bye-product by washing with water is not at all suitable for the climate. Acid washing apparently would be the more rational way; but this cannot be entertained under the present Gas Act, owing to the effect of sulphuric acid on the illuminants present in the gas. Only those actively engaged in gas-works can appreciate the difficulties surrounding the efficient removal of ammonia

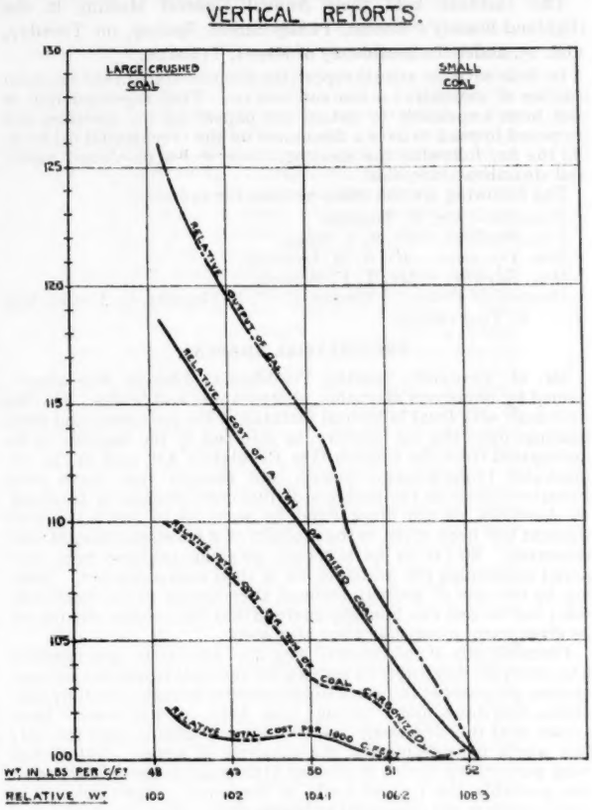


Diagram No. 2.

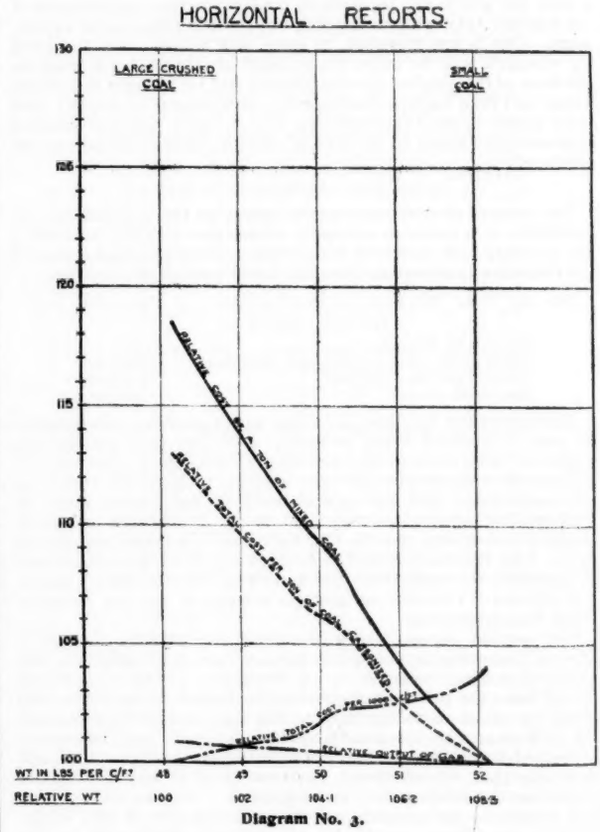


Diagram No. 3.

with water at 80° or 90° Fahr., and an air temperature of 95° or 100° Fahr. in the shade.

In the larger works, with all the chemical supervision possible, the extraction of ammonia sometimes gets beyond control on hot

days. This is, of course, mainly due to the decrease in the solubility of ammonia in water at increased temperatures; but many other factors have also an important bearing on its removal. The efficiency of extraction—*i.e.*, the percentage removed—is comparatively large, even at 90° Fahr., provided the quantity of ammonia in the crude gas exceeds 50 grains per 100 c.ft. But as the ammonia decreases below this, and at increased temperatures, the quantity of water and the washing area required per 1000 c.ft. of gas treated increase at a very great rate, and rapidly reach dimensions beyond economical working. Data concerning the washing area and water required, and also the efficiency of extraction at various temperatures, are urgently needed.

Various methods for either increasing the efficiency of the removal of ammonia with water, or for its removal by other means, have been suggested. Those worthy of consideration are

(1) Cooling the water required for washing to a suitable temperature with a refrigerating plant.
(2) Removing the whole of the ammonia, or that escaping the washer-scrubbers, with weak sulphuric acid.
(3) Removing the ammonia by bubbling the crude gas through solutions of iron or zinc sulphates—the latter being the Cobb process.

The cooling of water has been tried in another State; but it is unfortunately not known whether the scheme met with financial success.

Washing the gas with weak sulphuric acid has not been tried on a commercial scale in gas-works in New South Wales. At the coke-ovens of the Broken Hill Steel Works, Newcastle, the whole of the ammonia is recovered by washing the gas with acid; but the sulphate made is not of the snow-white colour generally associated with the gas-works product, and, as might be expected, it also contains less ammonia.

Washing the gas with a solution of salts of iron or zinc appears to possess certain advantages, in addition to the efficient extraction of ammonia, justifying a trial on a small commercial scale.

In the light of present knowledge, washing with weak acid appears the most positive scheme—particularly for the efficient removal of the ammonia escaping the washing plant; but the capital charges in connection with the necessary acid scrubbing plant, the cost of circulating the large volume of weak acid, and that of concentrating the resultant liquors, may be more than the value of the ammonia recovered. Hence, in endeavouring to prevent a loss, the net result may be an increase in the cost of gas.

CORROSION OF GASHOLDERS.

Probably 50 p.ct. of the total value of the materials used in the construction of a gas-works is represented by iron and steel, in its various sections and shapes. Unfortunately, iron and steel are substances liable to decay by corrosion—a decay more rapid than that of wood or any other material of construction. Thousands of pounds are spent every year in painting steel structures, and on the repair and renewal of various articles, such as piping, gas-services, and meters, which have badly corroded. If this rapid decay could be arrested, the effect on the cost of production would be very great, and eventually benefit the consumer of gas. It has often been observed, and many proofs have been submitted to show, that the old largely hand-worked metal of about thirty years ago is superior in rust-resisting qualities to the usual modern steel and iron. But a perusal of the literature on corrosion shows that there is practically nothing to choose between wrought iron and steel, as at present manufactured. It is a popular belief in the gas industry that holders constructed of wrought iron withstand corrosion better than steel, for the reason generally advanced that iron is purer than steel; but this belief is not based on any scientific reasoning.

Last year, the Australian Gas Light Company found it necessary to re-sheet one of their holders, of a capacity of 3,500,000 c.ft.; and the best material to use—iron or steel—became a matter of extreme importance. It was generally felt, however, that the purest material possible should be used. As the Company had holders which showed no trace of corrosion after fifty years' useful life, and others which had been partly re-sheeted after a life of only twenty years, it was decided to procure small samples of plate from these holders, and submit them to chemical and microphotographical examination, together with samples of steel and iron plates purchased on the local market. It was expected that the data, thus obtained, would help to determine the best material to use. Subsequent to this decision, samples of plates from holders which had given good and bad service were obtained from the North Shore Gas Company and the South Australian Gas Company, Adelaide; also samples of steel main and service pipes, which had been recently laid, and had badly corroded. These were also examined.

Through the courtesy of the Engineer of the Australian Gas Light Company (Mr. Andrew Wilson), he (Mr. Tindale) was permitted to give a summary of the data accumulated. The whole of the chemical and microphotographic examinations were made at the New South Wales Government Testing Laboratory, under the supervision of Mr. Lacey.

THE CORROSION OF IRON AND STEEL.

The general nature of the action which takes place when iron or steel rusts or corrodes is now fairly well understood. Though five theories have been advanced from time to time to account for the corrosion of iron, only two of them have been generally accepted—the acid and the electrolytic theory. According to the electrolytic theory of corrosion, the presence of pure oxygen and liquid water alone are essentials to the formation of rust upon the surface of pure iron. In the acid theory, these substances are not sufficient, a trace of acid to effect the solution of the iron being absolutely essential. The rate of corrosion is influenced by many factors, the more important being:

(1) The chemical composition of the sample of iron or steel.
(2) The physical treatment to which the metal has been subjected.
(3) The presence in the water of acids, salts, or alkalies, considered as electrolytes.
(4) The temperature.
(5) Contact with more or less electro-negative substances which are metallic conductors.
(6) The presence of stray electric currents passing to and from the sample of iron or steel.
(7) The quantity of dissolved oxygen present in the water or moisture in contact with the sample.
(8) The presence of rust.

In addition to these factors, all of which have been proved to affect the rate of corrosion, there are many others which have not yet been established by satisfactory experiments. It has often been noticed that any condition of twist or strain is liable to set-up serious corrosion in the parts affected, though the chemical compositions of the strained and unstrained parts are identical. It has been established that the cause is due to physical differences

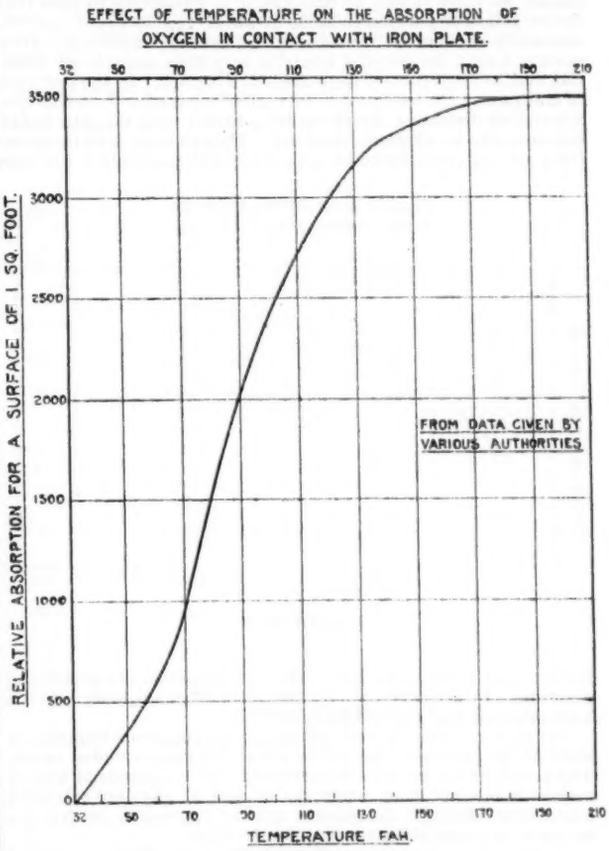


Diagram No. 4.

which set-up a potential difference between the strained and unstrained parts, resulting in local corrosion. A rise in temperature causes the combined affinity of oxygen and water for iron to be rapidly increased, thus tending to accelerate corrosion. From numerous experiments, it has been shown that the maximum amount of oxidation takes place at temperatures between 60° and 80° C. This is illustrated in Diagram No. 4. In addition, a rise in temperature causes unequal heating, particularly in large masses of metal which cannot well be subjected to a uniform rise in temperature throughout their entirety. Electrical activity is thus set-up between the warm and cool portions, resulting in increased corrosion.

It is a matter of common knowledge that the presence of soluble salts dissolved in water in contact with iron has a marked influence on the rate of corrosion. Experiment made with salts in solution, in comparison with distilled water, prove that an increase in the concentration of the salts results in increased corrosion until a maximum is reached, when the salt is said to be at its critical concentration. From this point onward, corrosion decreases again—though the concentration of salt in water is increased—until the limiting concentration is reached, at which point iron may be kept for an indefinite period in contact with air and such solutions, without undergoing any appreciable cor-

rosion. Temperature has also a marked influence on the corrosive action of aqueous solutions of electrolytes. Corrosion is very nearly double if the temperature rises from 18° to 40° C.

INFLUENCE OF CHEMICAL COMPOSITION UPON CORROSION.

The principal impurities present in wrought iron and steel are silica, sulphur, phosphorus, manganese, copper, and certain other substances known as non-metallic impurities.

Silica.—The amount in properly made mild steel is less than 0·1 p.ct.; and this quantity has practically no effect on the physical properties. As regards corrosion, the greater the percentage of silica the more resistant does the alloy become, until a practically incorrodible metal results containing 20 p.ct. silica. As regards corrosion, nickel alloys closely resemble those of silica.

Sulphur.—This is an undesirable impurity, and is a stimulator of corrosion.

Manganese.—All commercial steels contain a certain small percentage of manganese as an essential constituent. Without manganese, the sulphur and dissolved oxides make the steel red, short, unsound, and practically worthless. Various investigators have drawn attention to the increased corrodibility of iron induced by the presence of manganese. Numerous samples of iron ore have been examined; and it was soon observed that the majority of those which had stood corrosion satisfactorily were either free from manganese or contained less than 0·2 p.ct. The most corroded specimens, in the majority of cases, contained manganese to the extent of 0·4 p.ct. In connection with the effect of manganese on constituents of coal gas, it is interesting to note that the oxidation of paraffin to acids by air at 130° to 135° C. can be materially accelerated by means of manganese compounds. After several hours, the paraffin contains very little unoxidized material, and 40 to 50 p.ct. of fatty acids are formed. In the presence of manganese, the oxidation is not limited to paraffin—vaseline oils, mineral oil distillates, distillates from brown coal tar, and heavy benzines can be similarly oxidized. Though such high temperatures are not experienced in connection with gasholders, the time

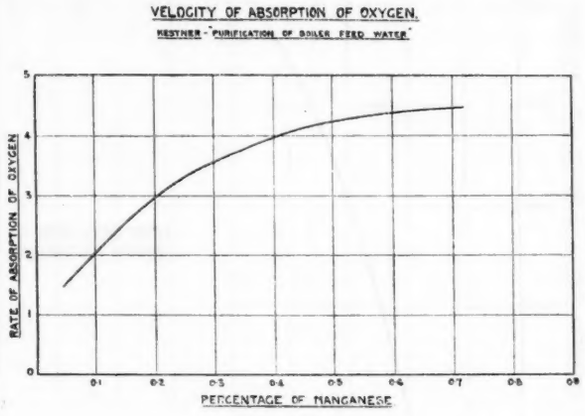


Diagram No. 5.

factor, being longer, may be of sufficient importance to permit the reaction. In Diagram No. 5, the effect of manganese on the oxidization of iron is graphically shown.

Phosphorus.—This is, perhaps, the most dangerous impurity in steel, as its principal effect is to cause brittleness under shock. The action of the phosphorus content on the resistance of iron to corrosion has not been made the subject of any very extensive experiment, although the general opinion appears to be that the presence of much phosphorus is not desirable.

Copper.—According to recent researches, a small percentage of copper is supposed to increase the resistance of iron to corrosion; but this theory is not generally accepted.

Occluded Gases—Non-Metallic Impurities.—Much evidence has now been collected in support of the theory that combined and occluded gases are very important factors in the corrosion resistance of various types of metal. It has always been a mystery why old forgings have so well resisted corrosion. With the repeated re-heatings and hammering that these hand-forged metals underwent, it is reasonable to suppose that they were wonderfully densified and de-gasified, because they have always shown themselves to contain very low percentages of nitrogen.

With such a formidable array of factors contributing towards the corrosion of iron and steel, one sometimes wonders how holders and service-pipes can withstand the onslaught and corrosion at all. As there are holders in Australia whose useful lives vary from ten to forty years, it is apparent that the subject is well worthy of the fullest investigation.

A feature of the corrosion of those gasholders examined was the fact that leaks appeared mainly on the crown and on the inner lifts; but only in those sheets facing north-west. In three-lift holders, the bulk of the leaks were present in the inner lift, while only a few were present in the middle lift, and none at all in the outer lift. In all cases corrosion had begun on the inside of the holder, resulting in leaks which showed mainly at the horizontal joints of the plates immediately above the lap. There were very few leaks at the vertical joints.

An examination of the inside of the holder showed that the whole of the sheets had rusted; but corrosion was very much more pronounced on the highest temperature section—*i.e.* the north-western. The sheets of the inner lifts, other than those that had absolutely rusted through, were practically half the original thickness; while those of the middle lift showed less signs of internal corrosion, and those of the outer lift none at all. Deposits of rust were found at the horizontal joints, on the ledges formed by the laps of the sheets. The rust procured from portions of the holder contained salts of ammonia, such as cyanide, sulpho-cyanide, and sulphates, together with oily matters and free sulphur. The leaks in the crown of the holders were localized, roughly, in the middle third of the distance between the centre and the curb; while those in the side sheeting were, roughly, in the middle third of the distance between the curb and the cup.

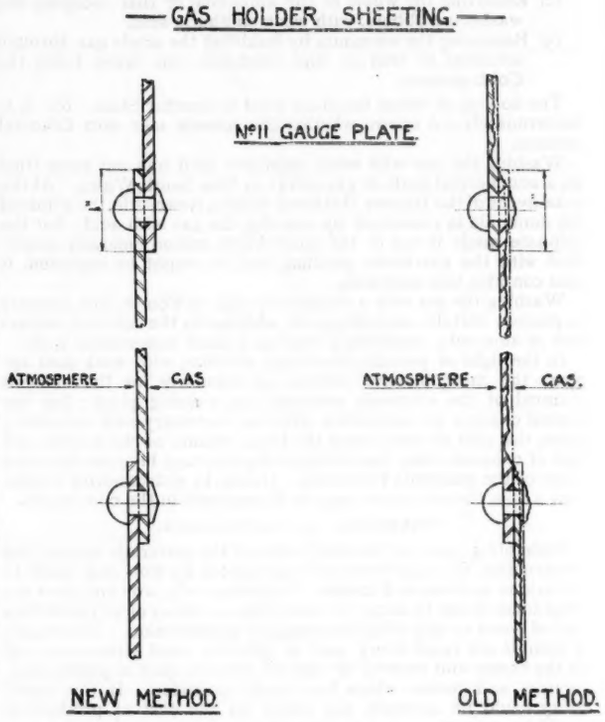


Diagram No. 6.

It is evident that corrosion in these holders was due to at least two factors—viz., the temperature of the iron and the influence of electrolytes. As previously mentioned, temperature increases the affinity of oxygen and water—present as vapour in the gas—for iron. In addition, the rise of temperature causes unequal heating, particularly in a large mass like a holder. Electrical activity is then set-up between the warm and cool parts, resulting in increased corrosion at the warmest point. The electrolytes are present in the form of ammonium salts in solution in water; and their effect on corrosion is very pronounced at increased temperatures, thus accounting for the difference in corrosion between the north-western and other sides of the holders. But it has also been mentioned that an increase in the concentration of salts in water results in an increased corrosion until a maximum is reached; then, though concentration is increased, corrosion decreases again. This fact may probably account for the corrosion found at certain belts of the inner lifts.

In these cases, the aqueous vapours which collected on the sides of the holder dissolved what salts were present, and, flowing down the sides of the sheeting from ledge to ledge, gradually increased in concentration until the optimum conditions were reached, at which point the maximum corrosion occurred. The solution continued on its downward course at a gradually increasing concentration, but with less corroding properties, and eventually dropped back into the tank from the underside of the cup.

As already stated, the quality of the metal used is also an important factor. In the tables following are given the results of chemical and microphotographical tests. It will be noticed that all the metals which failed contained more manganese than those which were satisfactory. On the other hand, the metals which gave good results were far from pure, containing much phosphorus and much slag. It has been suggested that slag inclusions hinder the corrosion of iron; but according to numerous experiments made by Richardson, it is concluded that any superior resistance to corrosion that wrought iron may possess is not due to slag inclusions, but to some other cause, such as purity of iron.

The effect of phosphorus is somewhat doubtful; but on the whole it would appear, by these examples, to have some value in

retarding corrosion. Authorities differ on the effect of phosphorus on corrosion; but it is interesting to note that a patent has recently been granted in the United States in connection with the use of a solution of iron phosphites and sulphuric acid, in order to render the surface of the metal resistant to corrosion. A case of corrosion which came under the President's notice of cast iron salt-water cooled condensers—material which had badly rusted—on testing showed that the material which contained the most phosphorus had rusted less than that containing the least.

Although it would appear, from the data at hand, that manganese is one of the causes of corrosion, it must be borne in mind that the mere presence of manganese may not be the immediate cause of corrosion, but the fact that the higher manganese modern metal is apt to lack in chemical homogeneity. It is known that a high manganese metal is more easily rolled. Its presence permits the selection of cheaper and inferior raw material, and more rapid and perhaps careless methods of manufacture. On the other band, a metal free from manganese has from its very nature to be carefully watched through the whole process of manufacture.

In Table III. are given the chemical analyses of various iron sheets obtained on the local market. The high percentage of manganese is noticeable in the majority of examples. It will be realized that the whole of the evidence obtained tends to show that only the purest material should be used; and the material therefore selected to re-sheet the first gasholder at the Mortlake works was "Armco" iron. In the reconstruction of this holder, the lap of the sheets has been reversed, thus preventing the deposit of any rust or electrolytes on the ledges. By placing the latter on the outside, they are under inspection, and may be easily protected with paint. The old and the new method of laps are shown in Diagram No. 6.

While it is important to provide pure metal for gasholder sheets, it is also of equal importance that as pure a gas as possible comes into contact with the pure metal. Town's gas should contain the minimum quantity of ammonia, carbonic acid, cyanides, and other impurities, and be practically free from oxygen. Oxygen is the dominating factor in determining corrosion; the latter cannot take place in the absence of the former. It is evident that temperature is a most important factor, particularly in the summer. The working of holders should be so arranged that stocks of gas, in the summer time, should be the minimum compatible with safety and continuity of supply. The inflation of a holder with gas, and its retention in such a condition for weeks on end, at sun temperatures varying from 120° to 150° Fahr. is a procedure calculated to promote the maximum amount of corrosion. Unfortunately, the inner lifts all have a tendency to be "flying"—*i.e.*, always out of water. But to reduce corrosion, holders should be used in rotation, thus allowing the inner lifts to be periodically submerged to the maximum. This submersion has added benefits, in enabling what salts are present on the various inner ledges of the plates to be dissolved and removed. The oiling of the inside of holder plates has been tried. It has much to recommend it in colder countries; but from experiments conducted under Australian conditions, oil has not proved satisfactory at high atmospherical temperatures, owing to the effect of the latter on the viscosity of the oil, causing it to run off the plates.

The subject of the protection of the inside of holder plates is now under investigation. While a good deal of information has been collected, it must be admitted that it is far from conclusive; only the mere preliminaries of an important research having been covered.

EXAMINATION OF SHEET IRON.

TABLE I.—*Unsatisfactory Material.*

Sample.	Chemical Analysis. Per Cent. by Weight.							Microscopical Analysis.
	C.	Si.	P.	S.	Mn.	Cu.	Ni.	
Gasholder North Shore Gas Company	0·086	0·08	0·16	0·032	0·28	trace		Large slag inclusions. Holder erected 1901.
Steel gas main	0·064	0·028	0·014	0 041	0·36			Good quality wrought iron with occasional large slag inclusion. Grain considerably distorted in places, due to cold working.
Gasholder plate. Inner lift	0·067	0·155	0·450	0·013	0·14	trace		Poor quality iron. Numerous large slag inclusions. Phosphorus segregations. Holder erected 1887.
Gasholder plate. Outer lift	0·063	0·155	0·416	0·014	0·14	trace		Poor quality iron. Numerous large slag inclusions. Phosphorus segregations. Holder erected 1887.
Service-pipe	0·060	0·047	0·085	0·062	0·36	trace		The structure at inside and outside of pipe is the same; but a neutral zone exists. Grain considerably distorted, due to cold working.

TABLE II.—*Satisfactory Material.*

Iron sheet from Kent Street holder giving good service	0·08	0·14	0·27	0·03	0·04	0·04		Gasholder over fifty years old. Good quality commercial wrought iron. Numerous small slag inclusions.
Inner lift gasholder South Australian Gas Company	0·086	0·26	0·424	0·029	0·11	trace		Numerous slag inclusions. Fairly large grains.
Crown sheets gasholder South Australian Gas Company	0·056	0·25	0·175	0·022	0·11	trace		Numerous slag inclusions. Fairly large grains.
Gasholder South Australian Gas Company, outer lift	0·046	0·25	0·41	0·025	0·10	trace		Numerous slag inclusions. Fairly large grains. Structure of tops same as bottom.
Gasholder South Australian Gas Company, cup plates	0·034	0·28	0·48	0 02	0·12	trace		Numerous slag inclusions. Fairly large grains. Structure of top same as bottom.
Gasholder North Shore Gas Company	0·026	0·15	0·42	0 025	0·09	trace		Numerous slag inclusions. Holder erected 1886.

TABLE III.—*Material Purchased on the Open Market.*

"Lowmoor" iron	0·052	0·118	0·118	0·033	0·12	trace	trace	Good quality wrought iron. Small slag inclusions.
"Armco" iron	0·056	0·012	0·027	0·035	0·065	0 066	0·05	Good quality iron.
Copper bearing steel	0·16	0·047	0·015	0·035	0·350	0·15	—	Good quality mild steel.
British sheets, 578	0·077	0·045	0 033	0·034	0·310	*Nil*	trace	Very good quality ingot iron. Shows slightly the effect of cold working. Fairly large grains.
British sheets, 547	0·130	0·056	0·068	0·062	0·660	0·820	0·09	Poor quality mild steel. Streaks of manganese sulphide. Pearlite well distributed. Would probably corrode readily.
Belgian sheets	0·047	0·009	0·003	0·030	0·31	0·020	0·05	Good quality iron. Occasional inclusions at boundary junctions—probably a manganese compound which might accelerate corrosion.

CONVEYING MACHINERY.

Different types of conveying and elevating machinery were described by Mr. Gardiner Mitchell, of Aberdeen, in a paper which was submitted by him lately to the Institution of Mechanical Engineers. The conveyor belt is, he said, considered to be the most vital part of any belt conveying plant; and it is advisable to instal a first-class belt. Though the initial cost is much greater than many of the inferior classes, the best is the greatest economy. For all material with sharp cutting edges, a rubber and canvas belt should be used. In observations which have been made of the wear that takes place in belting, rubber and canvas belting was found to be the most efficient. Next came balata, the wear of which is about four times greater. In solid woven canvas, the wear was about five to six times greater than what took place on rubber and canvas; and with sewn cotton duck canvas, the wear was about seven times greater than with rubber and canvas. The power required to drive belt conveyors is very small. In fact, this type is considered to be the most economical as regards power. As to gravity-bucket conveyors, the capacity ranges from 10 to 150 tons per hour, with speeds of from 30 to 40 ft. per minute, according to the class of material being dealt with. The power necessary to drive a gravity-bucket conveyor is found to be remarkably small. Push-plate conveyors are efficient in operation, do not require much attention, and have the great advantage of being capable of depositing the material at various points along its length. The power required to drive this type of conveyor is, however, very high.

"MAC'S" SAD-IRON GAS SAVER.

The use of a plate, with one aperture in it, on the hot-plate of a gas-cooker or over a ring is by this time pretty familiar to most housewives, and to the ironmongers who have supplied the special sheets. The Delancey Tool and Engineering Works, 68A, Delancey Street, Camden Town, N.W., have adapted the idea to sad-irons; and they are now supplying a small gas-iron fitment with an angle ring frame and corrugated centre plate, in which are cast two holes the shape of the flat iron. The idea is that the saver is placed over the gas-burner, and that, while one iron is getting hot, the temperature of the other is being gradually raised, so that, when the hot iron is lifted, the other is merely pushed over, and is ready quickly. Clearly, if three irons are kept going at once, the saving is even more material. The price of the article, which also makes a good flat-iron stand, is, we learn, only 2s. 6d. retail.

"Mac's" Sad-Iron Gas Saver.

THE "STEERE" TAR CAMERA.

In United States gas-works, there is largely used for the determination of tar in gases a device known as the "Steere" tar camera, some particulars of which were given in the "JOURNAL" for Nov. 26, 1918. To this information we are now in a position to add an illustration of the "camera," which, it may be remarked, is the development of a suggestion found in the 1909 "wrinkles" of the American Gas Institute. The method was worked-out for determining the quantity of tar carried by coal gas at the different stages of condensation; but it has also been found equally valuable for determining the quantity of suspended matter carried by any gas or the atmosphere. It is called a "tar camera" because of the stain left by the tar taken from the sample of the gas under test. In other words, it is used to take "tar pictures"—pieces of special white paper through which a certain amount of gas has been drawn. The tar carried by the gas leaves a characteristic stain on the paper; and the amount of it can be determined either by comparison with a standard paper, or much more accurately by weighing the paper before and after taking the picture.

The construction of the camera is well shown by the illustration; but it should be added that the instrument is made entirely of aluminium, so as to be unaffected by any of the constituents of the gas. The test paper on which the tar picture is taken is shown in the section of the widest part of the camera. Where the gas is under pressure, it is only necessary to screw the camera into the apparatus at the point to be tested. The outlet is connected by rubber tubing to the test meter or measuring bottles. If, on the other hand, the gas is under vacuum, it is usually simplest to use aspirators. If standard aspirator bottles of 1 c.ft. or ½ c.ft. capacity are used, the test meter is not necessary, as the gas is measured as it is drawn into the aspirator. The same aspirator bottles can also be used in place of the test meter for measuring the gas when it is under pressure. In long series of tests where a great number of pictures are to be taken with the gas under vacuum, the best arrangement is to connect the camera through a test meter, and then tap into a point in the system which is under a greater vacuum than that being tested. In this way, pictures can be taken very rapidly and accurately. The connection between the camera and the apparatus must be as short as possible.

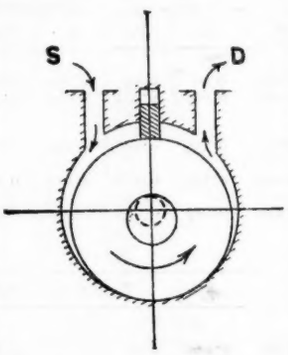
Ordinarily, the proper amount of gas used in a test is either 1 c.ft. or 10 c.ft. Tar in a finely-divided state will not all be stopped by the first paper, but will go on through and stain the next one, and sometimes four or five. Two is the number usually employed for routine work; but where the papers are to be weighed to determine accurately the amount of tar, not less than four should be used. As there has been found to be a rough relation between the shade of tar stain and its weight, it is possible to approximate the quantity of tar in the gas by comparing the stain with a standard, though such a method naturally depends largely upon the observer's skill and ability in comparing the colour shades. Retort gas, water gas, and producer gas all give different stains; and the shade of the stain from any kind of gas will be largely influenced by the amount of free carbon it carries. The density of the picture must be given consideration, as well as the shade. The calorimetric tests are not designed for accurate quantitative results; their value is rather comparative. They will show any increase or decrease in the quantity of tar vapour present; while they also indicate relatively the quality of the tar, which is an index to the retort-house, producer, or generator operation. If an accurate quantitative determination is required, it can be made by weighing the test papers very carefully, and in a perfectly dry atmosphere.

We understand that the useful little device here referred to is now handled in this country by Messrs. Walker, Crosweller, and Co., of No. 265, Strand, London.

THE "SQUEEGEE" PUMP.

The "Squeegee" patent positive rotary pump is a simple but efficient piece of apparatus, which is suitable for heads up to 150 ft., and suction lifts of 20 to 25 ft. It possesses no valves, plungers, or intricate mechanism to get out of order, but has a simple rolling squeezing action. Another point is adaptability; for it can be belt driven or direct coupled to any ordinary speed electric or petrol motor. Owing to the entire absence of sliding parts, it can be run at speeds up to 1000 revolutions per minute. Both materials and workmanship are of the best; and the most suitable metals are chosen, according to the duties the pump has to perform. As all parts are standardized and made to gauge, they are interchangeable.

Exclusive of the gland, bolts, and nuts, the "Squeegee" pump comprises six parts—the casing, two covers, shaft, and two rotors. The illustration shows the action of the pump. As will be seen, the displacement or pumping action is caused by the rolling motion of the rotors. When the shaft is rotating in an anti-clockwise direction, the rotor rolls round in the same direction; and, on account of being smaller in circumference than the track in the casing, it rotates in a clockwise direction, but at only a fraction of the speed of the shaft, in proportion to the difference between the circumference of the casing or track, and that of the rotor. The point of contact between the rotor and the casing is continuously moving forward in an anti-clockwise direction. A small valve is fitted between the inlet and outlet ports. Therefore, as the point of contact moves forward, suction takes place on the inlet side, and the liquid is forced forward in front of the rolling rotor, and out of the outlet port. The valve prevents any liquid from passing through from the delivery to the suction side of the pump. In order to overcome pulsation, two or more rotors are fitted.



The makers of the "Squeegee" pump are Messrs. Jobson and Beckwith, Ltd., of No. 104, High Holborn, London, W.C.

The Rees Roturbo Gas Pump and Mixer.

In the issue of the "Engineer" for Dec. 30, there appears an illustrated description of the Roturbo gas pump and mixer. It is pointed out that, in many chemical processes, it is required to produce a very intimate mixture between certain gases and liquids, in order to dissolve the gases in the liquids or to allow chemical action to take place between the two. Various methods have been adopted to accomplish this, as, for example (1) allowing the gases to bubble up through the liquid in a vessel or series of vessels, (2) forcing the gases upwards through the inside of a tower down which the liquid falls in the form of a spray or rain, or (3) spraying the liquid into a vessel containing the gases. All such methods are open to the objection that a really intimate mixture is not produced. The Rees roturbo patent gas pump and mixer has been designed to overcome the known defects of the above-named methods, by creating a very intimate mixture, and thus effecting the required solution or chemical action in the smallest possible time and space. It draws in the gases by creating whatever vacuum is necessary to give the required flow through the system, and mixes them inside the pump with the liquid which is drawn in through a separate branch; the mixture of gases and liquid being then discharged together into the receiving vessel. The device is the latest development of the Rees Roturbo patents, which have previously been embodied in the Roturbo pressure chamber pump, jet condenser, and high vacuum air pump. Whereas the high vacuum air pump is designed to withdraw a relatively small amount of air from a high vacuum, the gas pump and mixer is designed to draw large volumes of gas from a comparatively low vacuum, and then to mix them with the entraining liquid.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Discussion upon the Gas Investigation Committee's Sixth Report.

SIR,—With reference to the reply to the discussion upon the Gas Investigation Committee's Sixth Report, I enclose herewith copy of a letter I have recently addressed to Prof. Cobb and Dr. Parker, with reference to their comments on my strictures.

E. G. STEWART.

Gas-Works, Fulham, S.W., Dec. 28, 1921.

[ENCLOSURE.]

Dec. 20, 1921.

To Prof. J. W. Cobb, C.B.E., B Sc., and Dr. A. Parker.

Gentlemen,—I have read with interest, and have to thank you for, your reply to my contribution to the discussion upon your report. While I find it generally satisfying as regards the reasons underlying your lines of argument, it would seem that you misunderstood my plaint, *re* waste-heat boilers.

It was not my desire that you should in any way employ my published figures unless they met your requirements. For, as I made clear in the discussion, if you did not choose to take them, or others which were extant, there were waste-heat boilers at work in England wherefrom you could have ascertained the required data.

I had in mind that you might have done as many engineers, in these Isles and abroad, had already done in the case of the Fulham installation, after reading my paper—visited a plant and obtained, by experiment or otherwise, the information considered necessary to form an accurate estimate of the capabilities of such a boiler.

I do feel that, in view of the vital efficiencies and valuable comparisons that depend upon the accuracy of your estimate, it should have been based on more than theoretical postulates, however tentative the result claimed, in view of the tendency of such results being considered as facts when issued under the auspices of the Institution.

As, however, you have called certain of my results into question, may I be allowed to explain them?

1.—The thermal balance given with my contribution was stated to be an amplification of the one in my paper. It does not refer, as your calculations indicate that you think, to the plant fitted with the waste-heat boiler, but to a twin generator carburetted water-gas plant operated to efficiently produce blue gas. Perhaps you were misled by a coincidence of figures.

2.—The output figures of 107 and 90 lbs. per 1000 c.ft. from a waste-heat boiler are not incompatible. The first, you will find, is in terms of water evaporated from and at 212° Fahr. The second, to correspond with your own method of stating results, is pounds of steam at 100 lbs. pressure. These figures are based on the fuel utilization of heat normally wasted; but constancy is, of course, dependent upon the operation of the generator. They do not include losses entailed in distributing the steam, or in the washing-out of the boiler.

3.—Reference to the 1919 20 "Transactions" will show that I opined 70 p.ct. was too high an efficiency to include the generation, transmission, and distributing of steam, not for the generation of steam in a direct-fired boiler.

4.—With reference to your reply to my remarks concerning the crediting of the fuel account with recovered fuel, I was looking at this matter from the point of view of the efficiency of gasification as distinct from the efficiency of gas making.

I look forward to the results of your present inquiry, which should also settle any differences of opinion between us. I propose sending a copy of this letter to the Technical Press; and I trust you will be able to amend the misconstructions you have placed upon my figures before your communication appears in the Institution "Transactions."

Yours faithfully,

[Signed] E. G. STEWART.

Glover-West Vertical Retorts for Copenhagen.—The Copenhagen Municipality have placed a contract with West's Gas Improvement Company, Ltd., for a Glover-West vertical retort installation comprising eighty retorts, together with the necessary coal-handling machinery. The plant is to be erected at the Eastern Gas-Works, Copenhagen.

Bilston Gas Light and Coke Company.—The Directors, in their report for the year ended Sept. 30, say that the profit and loss account, deducting the interim dividends, shows a credit balance of £16,846. After paying further dividends of 4s. per share on the "A" shares (less tax) and 2s. 6d. per share on the "B" shares (less tax), making with the interim dividends 8s. and 5s. per share respectively (less tax) for the year, there is a balance of £15,533. They have applied for an Order under the Gas Regulation Act, and hope that this will be granted and become operative as to payment of dividends from October 1 last. Consequent upon the increased cost of coal and the extra expenses involved by the coal strike, the Directors were reluctantly compelled to further advance the price of gas, which rendered obligatory a *pro rata* reduction in the dividends payable. The profits of the Company have been adversely affected by the causes referred to; but the Board have decided to continue the price of gas as at present, in the hope that the cost of manufacture may be reduced shortly. To meet the increasing demand for gas, they have had to extend the carbonizing plant. Later the Company will have to apply for necessary powers to issue additional capital. The Directors remark that, though the balance of £15,533 carried forward appears large, it will practically be all swallowed-up in the necessary renewals and repairs which have been deferred during the war.

REGISTER OF PATENTS.

Direct Recovery of Ammonia from the Destructive Distillation of Coal.—No. 147,736.

FIRM OF CARL STILL, of Recklinghausen, Westphalia.

No. 19,739; July 8, 1920. Convention date, Dec. 3, 1915.

The invention relates to a modification of that described in patent No. 28,072 of 1912.

The inventors thus refer to it: The principle underlying the process to which that specification relates consists in treating the gases and vapours with a quantity of water, constantly in working circulation, in such a manner that they are first cooled by direct action of the water in counter-current, and then in like manner again heated, after which the ammonia is separated as solid salt by means of acid in known manner. This treatment of the gases before the ammonia arrives at the saturator is for the purpose of first separating the tar by cooling, and then directly afterwards taking-up again the water precipitated from the crude gases by the cooling—the latter object being achieved by further direct action of the water which has been used for cooling and thereby heated. In this manner, the heat of the heated water is given up in steam; so that the gases in their re-heated condition carry with them (again as vapour) nearly the whole of the water which was contained in the crude gases—only a fraction remaining behind as a condensate containing ammonia.

The practice of this process presents in many respects difficulties which have not hitherto been explained. This is so, particularly, in the working of the second and more important period of the operation—the re-heating of the cooled gases by the direct action of the water heated by the preceding gas-cooling operation. Here it happens that, in spite of the sufficient dimensions of the apparatus and the correct use of the effective quantity of water, the re-heating of the gas to a comparatively high temperature, and the simultaneous cooling of the water correspondingly only partially succeeds. There remains a considerable part of the heat in the effective water, and this part is not transferred to the gas, in spite of still considerable difference of temperature between the two fluids.

Notwithstanding this, it has been observed that the heat relationship between a gas and a liquid in direct action on each other differs in different temperature zones. Water, as simple liquid, changes its heat content at every temperature, in constant degree and in strict proportion to the change of its temperature. It has practically a constant specific heat. A gas, on the other hand, the temperature of which is changed by direct action of water for example, is raised, changes at the same time its material composition, since it takes up water as vapour varying in quantity with the temperature of the gas and its degree of saturation. The heat of this vapour taken up comprises, beside the sensible heat proper to the gas, a considerable—mostly indeed a preponderating fractional—amount of its total heat content; and so it happens that the heat content of a gas in the mode of treatment coming into question changes with its temperature according to a very complicated law—in any case, not approximately proportionally to the temperature, as in simple liquids. In low-temperature zones there corresponds with a definite increase of temperature of the gas a small increase in the water vapour carried by the gas; and, in consequence, a comparatively small increase of the heat content of the latter. In higher temperature zones, on the other hand, particularly in the neighbourhood of the boiling point of water, the capacity of the gas for taking-up water is extraordinarily increased, so that here a definite increase of temperature produces a comparatively very great variation in the total heat content of the gas.

According to the invention, this difference in the thermal properties of a gas saturated with water in different temperature zones when the gas is heated or cooled by means of directly-acting water is accounted for by taking care that during the whole treatment, which must bring about a temperature change of the gas, there is a change of temperature of the active water which corresponds as exactly as possible with the simultaneous change of temperature of the treated gas. That is to say, there is produced, throughout the operation of cooling the gas and also of re-heating it, an approximation and amalgamation of the temperature of the gas on the one hand and of the water on the other. This is achieved by treating the gas during the whole course of the cooling and of the re-heating with counter-current water, the quantity of which is so graded for the different temperature zones of the gas, and in several successive sections, that the largest quantities of water are used in the highest temperature zones of the gas, and the smallest quantities in the lowest temperature zones. Thus in the highest temperature zones, where small temperature variations produce comparatively large heat changes, correspondingly greater masses of water are available for taking-up or giving-up these large quantities of heat, so that the temperature changes of the water during the heat transference may keep step with the simultaneous temperature variations of the gas. By a correct adjustment and grading of the quantities of water serving to transfer the heat in the several successive sections of the cooling or heating period, there is produced for the whole course a constant very close approximation and amalgamation of the temperatures of the water to and with those of gas, "which is of the greatest importance for a satisfactory working of the whole process."

Combined Retort and Steam Generating Plant. No. 155,558.

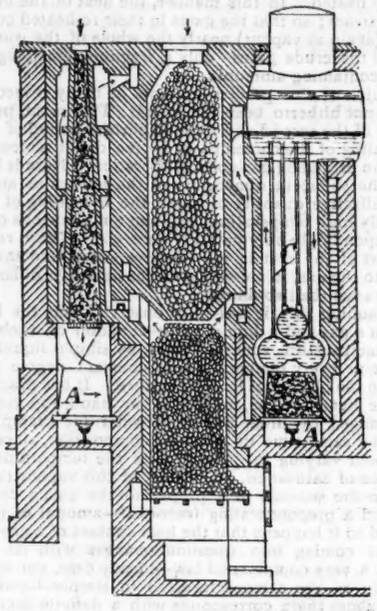
FRISCH, J., of Karlsruhe, Germany.

No. 15,128; June 3, 1920. Convention date, Dec. 18, 1919.

The patentee remarks: In known retort and like furnaces, the coke has hitherto been slaked with water; and thereby the large amount of heat contained in it and in the exhaust gases is lost. Furnaces are also known in which the heated material is pushed-out of the furnace

into a travelling receptacle in which the heat of the coke is utilized. This pushing-out of the coke is, however, very troublesome as well as expensive. Moreover, the coke, by being pushed-out, comes in contact with the open air, and is further burned; and, on the other hand, a large amount of heat is not utilized.

These disadvantages are said to be obviated by the present invention in the following way: The heat given off by the coke that is unslaked and coming out of the retort is utilized in the furnace itself. Thus the unslaked coke does not come at all in contact with the open air, but is let down to a conveying device of some kind—for example, a circular table, a rotary grating, or the like—and conveyed to a steam generator by the shortest way. This whole operation is carried out in the furnace itself; so that the heat of the furnace is utilized to the fullest extent. Further, the exhaust gases from the heating of the retort are fully utilized through the superheater and the upper boiler of the steam generator and conveyed to the chimney. By means of the whole installation, it is said to be possible to carry on working continuously, automatically, and so that the same can be observed. The coke coming from the retort is carried by the conveying device to the steam generator. When the unslaked coke has given off its heat, it is conveyed automatically from the furnace by the conveying device. The cooling of the coke is effected under the steam generator; air being excluded.



Frisch's Combined Retort and Steam Generator.

The object of the application is shown in one form of construction by a vertical section through the furnace in which the distillation of coal as well as the production of high-pressure steam is carried on. The working of the furnace as regards the carrying off of the gas from the coal up to the slaking of the coke is effected in the usual manner. Then the coke is let-down from the retorts on to a rotary grating A, and pushed under a steam producer. The grating, which is concentric with the retorts, comprises a sheet-metal trough and a cast-iron grating built-up of different plates. Into the trough water for cooling the cast-iron plates is poured. The grating is supported midway of its width by wheels running on a rail, and at its inner and outer edges upon open ball-bearings which serve to guide the grating in its circular path. The circular movement of the grating is effected by means of tooth-wheel gear of known kind. In order to prevent the friction of the material under conveyance retarding the movement of the grating, the width of the coke-conveying passage is gradually increased towards the steam generator.

This consists of an upper boiler with a lower boiler B vertically beneath it; the upper and lower boilers being connected through a cluster of boiler-tubes. The conveyance of the cooled coke from the steam generator is effected simultaneously with the arrival of fresh charges of hot coke at the generator. Above the conveying device D is an oblique bridge, against which the coke, after leaving the steam-generator, strikes, and thereby is carried outside. In this way the coke is to a certain extent removed automatically from the furnace, and continuous working is made possible. The coke is conveyed from the different retorts to the steam generator and thence outside; the discharging and charging of the different retorts being carried on continuously. With the six-retort type illustrated and a gas eliminating period, for example, of nine hours, the charging of the retorts and the steam generator is always effected at intervals of an hour-and-a-half.

The exhaust gases from the retort heating are not conveyed to the chimney without being utilized; but are first conveyed to the superheater, and are then conducted through the upper boiler of the steam generator.

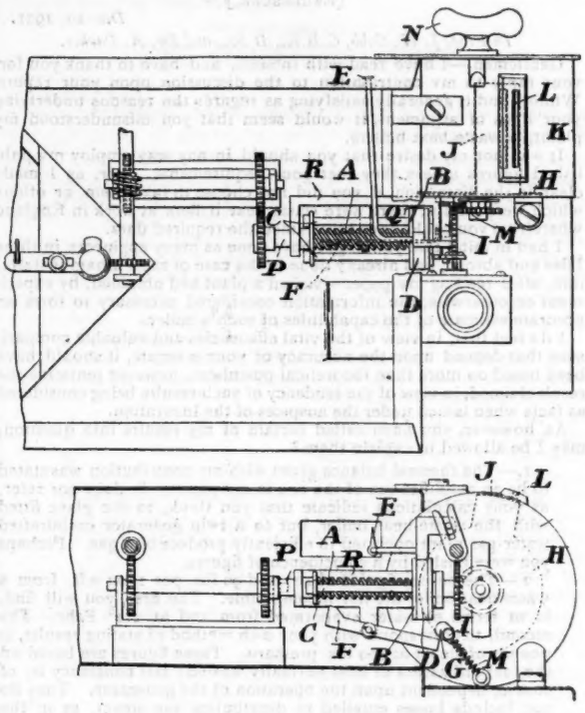
While the contents of the boiler are heated by the hot coke in the trough beneath the boiler, the circulation of the boiler contents is ensured by the fact that the boiler tubes nearer the centre of the furnace are subjected to the heat conducted from the central or main furnace to a greater extent than are the remainder of the tubes. The tubes therefore evaporate the water more rapidly than the remainder, and a circulation is set up in the direction of the arrow.

Prepayment Mechanism.—No. 170,813.

ANDERSON, J., of Edinburgh.

No. 24,376; April 19, 1920.

This invention consists in a coin-slot closing device for prepayment gas-meters, comprising a rotatable disc mounted on the axis of the coin-pocket having a slotted flange, the slot of which is normally kept out of coincidence with the coin-slot in the periphery of the casing of the meter—the two slots being brought into coincidence by reverse rotation of the coin-pocket before individual coins can be inserted. The invention also consists in a coin-slot closing device, in which the rotatable disc carries a pin locked by a lever brought into action when the full number of coins have been prepaid, so as to prevent the coin-carrier effecting uncovering of the coin-slot until further gas has been supplied.



Anderson's Prepayment Meter Mechanism.

A plan of the arrangement is shown; a section looking from the back of the meter with the valve-box removed.

There is provided a plain screw A having co-operating with it a nut B perforated to receive two longitudinal guide-rods C and carrying on its periphery a strap D operating an indicator E to show the quantity of gas still unconsumed for the coins inserted. When the nut is at the end of its travel (for the purpose of closing the slot and preventing entry of further coins), a pivoted arm F co-operates with a stop G of a coin-slot closing device. This comprises a disc H carrying an operating pin I and a slotted plate J; the latter extending across the mechanism contained in the casing K, and the slot being arranged to come below the main coin-slot L formed in the casing K. The two slots are normally kept out of engagement by means of a spring M, but can readily be engaged on the backward rotation of the coin-carrier which catches the thickened edge of the plate when it is desired to insert a coin unless the full number of coins for unused gas remain in the meter.

The nut B is returned as gas is delivered by the meter by the rotation of the gear-train illustrated, which turns the sleeve P carrying the frame bearing the rods C—the strap on the nut being prevented from rotating by a pin Q engaging a slot in the fixed bracket R.

Rotation of the screw C on the introduction of a coin, and operation of the handle N, is effected by mechanism described in patent No. 8223 of 1920.

Gas and Other Stoves.—No. 171,260.

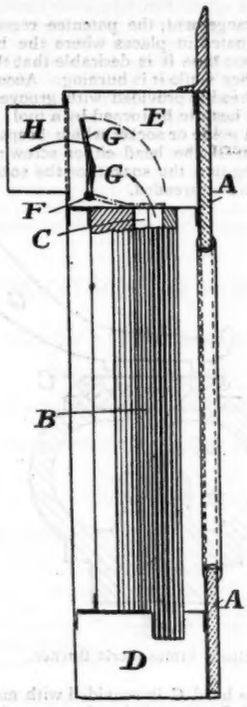
PRINGLE, T., of Chancery Lane, W.C.

No. 26,794; Sept. 20, 1920.

According to this invention, the material to be heated consists of an ordinary fire brick provided with longitudinal passages through it. At the ends of the passages dampers are provided to prevent the escape of the heated gases when so desired. The burners are arranged so that the products of combustion pass through the passages in the brick, thereby heating the fire brick; and as soon as it is sufficiently heated, the gas is cut off, the dampers closed, and the heat in the brick there radiates into the room or other place. The hot gases are led off in the usual way to the chimney through a pipe at the top of the stove.

A represents the stove casing (of any usual and suitable form), having a void therein for the passage of the heat radiated from the heated fire brick B. This is preferably made in two parts, each provided

with grooves, which, when brought together, form longitudinal passages C through the brick. The passages are curved or undulated, and provided with baffles where found necessary—the object being to abstract the maximum amount of heat from the gases in their passage through the flues. The fire-brick is preferably made with a foot-piece,



Pringle's Gas-Stove.

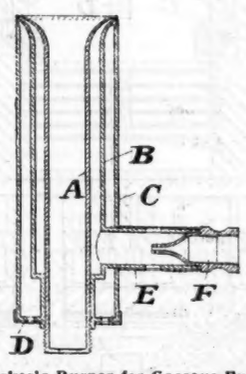
which serves to prevent the flame from being affected by draughts; and it is secured in position in the casing above the lower chamber D, in which the burners are located. Above the brick is a chamber E, in which is rotatably mounted a rod F carrying dampers G adapted to close over the upper ends of the firebrick passages C, and operated from outside the stove casing. H is the pipe for the passage of the waste gases to the chimney or flue.

Burner for Gaseous Fuels.—No. 171,424.

BARKER, A. H., of Queen Anne's Chambers, Westminster.

No. 13,791; May 19, 1920.

This invention relates to burners comprising three concentric tubes with bell-mouthed or flared ends, forming three concentric spaces—the outer and inner spaces serving for the admission of air, and the intermediate space serving for the admission of gas or gas mixed with primary air, with the inner tube adjustable relative to the intermediate tube, so that the annular space between their flared ends may be varied in thickness.



Barker's Burner for Gaseous Fuels.

In the form of burner illustrated, the three concentric tubes are arranged vertical—an inner tube A, an intermediate tube B, and an outer tube C. All the tubes are open at the top; while the outer and inner tubes are also open at the bottom, but are provided with regulating appliances D. The intermediate tube is closed at the bottom by a disc through which the inner tube passes, and a lateral branch E leads in to the side of the intermediate tube at a point near the bottom. At the end of this branch there is a mixing appliance F, of ordinary construction, for mixing gas with primary air in suitable proportion after the manner of an ordinary bunsen burner.

The combustion of the gas takes place at the top end of the annular space between the inner and intermediate tubes, which passage conducts the mixture of gas and primary air to the burning point as in a bunsen burner. The secondary air required for the combustion passes upwards, partly through the inner tube and partly through the annular space between the intermediate and the outer tubes.

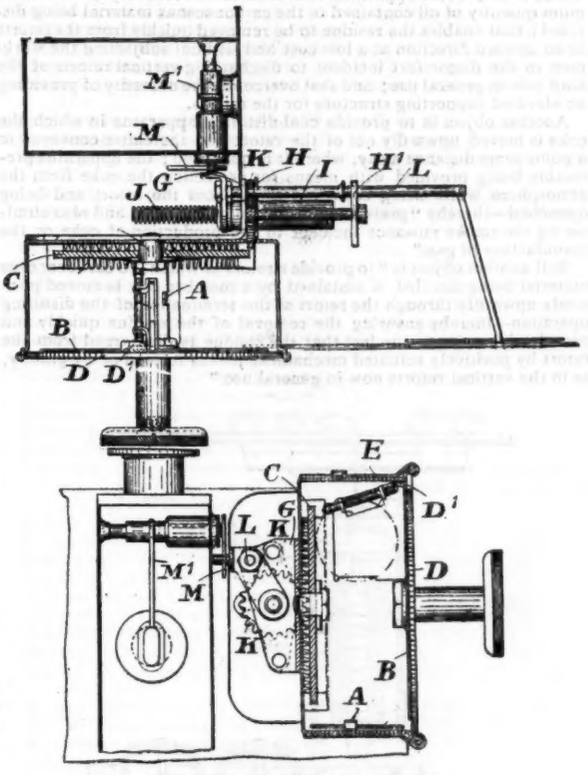
The top of the annular space between the inner and intermediate tubes forms the burner outlet. It is somewhat bell-mouthed, or formed of male and female inverted cones of approximately the same maximum diameter—the male cone being formed on or secured to the upper end of the inner tube A, and the corresponding female cone on the upper end of the intermediate tube B, so that by drawing the inner tube down into the intermediate one (by screwing or otherwise) the space for the issue of the gaseous mixture may "be reduced to an extremely small thickness." Further, the upper ends of the inner tube and the outer tube are also flared or bell-mouthed—thus causing a thin film of gas mixed with primary air to issue between two streams of air.

Coin-Freed Gas-Meters.—No. 171,445.

SIMPSON, S., of Newton Abbot.

No. 22,927; Aug. 3, 1920.

This invention relates to coin-freed gas-meters, in which the coin slot, the price-changing mechanism, and the handle for turning the coin-carrier are disposed in front of the meter, and are accessible for adjustment and price alteration. The object is to employ such mechanism with valve-controlling and operating mechanism as is covered by patent No. 21,721 of 1911.



Simpson's Coin-Freed Gas-Meter.

A sectional plan and a sectional elevation (at right angles) are given. B is the coin-carrier; and the measuring wheel C (disposed with its axis parallel with the side wall of the meter casing) is formed at its outer edge with a shoulder to receive the graduated price-changing disc D, which is retained in position by engagement of its peripheral teeth or slots with a pin and by two hook-shaped retaining members, one of which is detachable from the casing. The coin-carrier is rotatably mounted on the inner face of the disc, and is provided in the form of a disc secured to an operating spindle projecting through the disc, and carrying an operating handle at the outer end. The coin-holder is formed as a length of strip metal doubled upon itself and applied with one pair of its lateral edges secured to the disc B at a position where the coin-slot is formed. The bottom of the bend of the sheet metal is cut away to form a seat in which the coin may rest. The measuring wheel C is mounted on a centrally disposed stud in the back plate of the casing; and its free rotation is prevented by a spring washer engaging upon the front face. The wheel is formed with teeth for engagement by a coin when in position in the coin-holder. Upon the periphery it is formed with ratchet teeth for engagement with a pawl pivoted within the casing and mounted under the action of a leaf spring. Upon the rear face, the wheel is formed with teeth for the purpose of effecting the rotation of the pinion K of the measuring mechanism.

On the exterior of the casing, at the rear, there is mounted a bracket G, which, by means of the rods, supports the two bearing plates H H', and serves, with the former plate, as a bearing for a nut or sleeve I, which is screwed upon the threaded portion of the spindle J adapted to be rotated by the meter mechanism.

The pinion K, which is disposed between the bracket G and the plate H, is slidably carried by the sleeve I, with which it is engaged by means of an axial slot or key projecting through a slot in the wall of the casing, in order to engage with the teeth of the measuring

wheel. A rod L, slidably mounted in the bracket G and plate H^1, parallel with the sleeve I, carries at one extremity a forked arm or plate, which engages an annular groove around the extremity of the sleeve I, in order that it may receive longitudinal movement from the sleeve; and the arm also serves to carry a pin which engages the operating lever M of the gas-valve M^1. At the other extremity the rod carries a pointer showing on a scale the volume of gas paid for.

When it is desired to adjust the meter for a change in price, it is merely necessary that the retaining member E should be removed, when the disc D can be lifted from its position and rotated to the extent necessary, and returned to its position in the casing. By this means the position of the stop D^1 with reference to the stop A is varied, and thus the rotation of the measuring wheel is modified accordingly.

Distilling Carbonaceous Materials.—No. 171,563.

WALLACE, G. W., of East St. Louis, U.S.A.

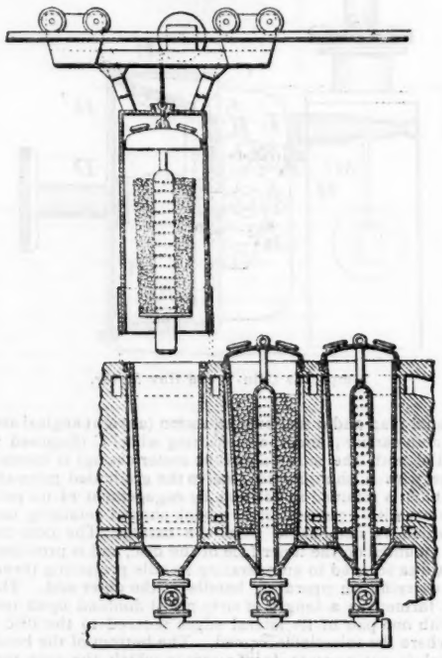
No. 27,278; Sept. 24, 1920.

This apparatus for distilling carbonaceous materials is of the type that is provided with one or more vertically disposed and externally heated retorts, of tapering cross section; each retort having a removable top cover and a removable perforated and upwardly extending take-off duct arranged at the centre of the retort with its lower end in communication with an exit pipe.

The present invention consists in improvements the main object of which is to provide apparatus that ensures the recovery of the maximum quantity of oil contained in the carbonaceous material being distilled; that enables the residue to be removed quickly from the retorts in an upward direction at a low cost and without subjecting the workmen to the discomfort incident to discharging vertical retorts of the kind now in general use; and that overcomes the necessity of providing an elevated supporting structure for the retorts.

Another object is to provide coal-distilling apparatus in which the coke is moved upwardly out of the retort and thereafter conveyed to a point some distance away, where it is quenched; the apparatus preferably being provided with means for protecting the coke from the atmosphere while being conveyed away from the retort and being quenched—thereby "preventing oxidation of the coke, and also eliminating the smoke nuisance incident to the production of coke or the manufacture of gas."

Still another object is "to provide a retort in which the carbonaceous material being distilled is sustained by a member that is moved positively upwardly through the retort at the termination of the distilling operation—thereby ensuring the removal of the residue quickly and completely, owing to the fact that the residue is discharged from the retort by positively actuated mechanical means instead of by gravity, as in the vertical retorts now in general use."



Wallace's Vertical Coal Distilling Plant.

The section of the apparatus shown, in its simplest form comprises a vertically-disposed retort whose upper and lower ends are cut-off from the atmosphere during the distilling operation; means for applying heat externally to the retort; a perforated take-off duct combined with the retort in such a manner that all the gases, vapours, and liquids evolved in the distilling operation will travel inwardly into the take-off duct through the coolest portion of the material in the retort, and then flow downwardly through the take off duct to a discharge pipe leading away from the apparatus; and means arranged above the retort for moving the take-off duct and the residue of the distilling operation upwardly out of the retort.

The apparatus can be provided with either one or a plurality of retorts; and when it is used for distilling coking coals, it is preferably provided with a member that protects the coked residue of the distilling operation from the atmosphere while being conveyed away from the retort to the point where it is quenched.

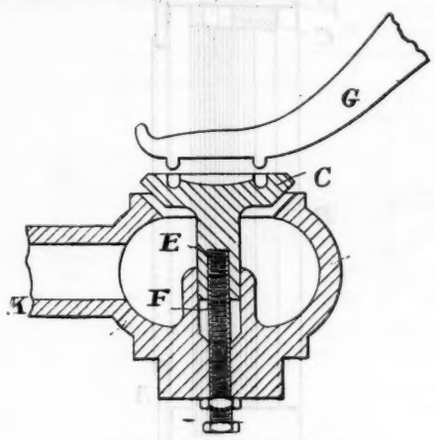
Atmospheric Burners.—No. 171,574.

HELPS, GEORGE, of Nuneaton.

No. 27,778; Sept. 30, 1920.

This invention relates to atmospheric burners of the type described in patent No. 142,222.

Alluding to the arrangement, the patentee remarks that, in some cases, burners are situated in places where the base is difficult of access, while at the same time it is desirable that the user should be able to adjust the burner while it is burning. Accordingly the upper surface of the burner-head is provided with grooves, recesses, or the like, so as to allow the head to be turned by a tool. The burner itself comprises, as before, a guide or socket which keeps the head true in all positions—the stem of the head either screwing on to a screw-threaded rod projecting into the socket, or the socket might itself be tapped and the stem screw-threaded.



Helps's Atmospheric Burner.

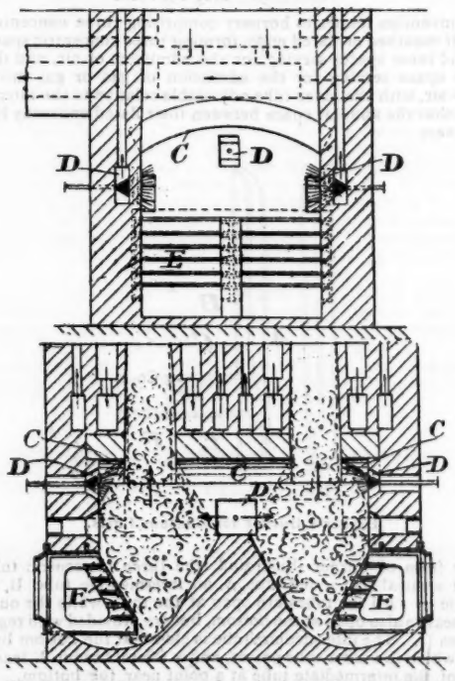
In the illustration, the head C is provided with means for allowing it to be turned by a tool G when alight—for example, by a groove or recess according to the tool adopted. The outer body is fitted with an internal socket E with a screw-threaded rod projecting into it, with a head provided with a stem which fits in the socket and screws on to the threaded rod F to regulate the primary air.

Gasification of Coal.—No. 171,805.

WOODALL, DUCKHAM, AND JONES (1920), LIMITED, and DUCKHAM, Sir A. M'D., of Grosvenor Gardens, S.W.

No. 25,255; Sept. 1, 1920.

This invention relates to "plants and processes" for the gasification of coal wherein the material is fed into vertical retorts externally heated by water gas—the material passing through the retorts during



Woodall-Duckham's Complete Coal-Gasification Plant.

the gasification process and forming an incandescent bed through which steam is passed to form the water gas for heating the retorts. At certain periods of the process the water gas is blown into the retorts, providing additional heat for the material therein.

The object of the invention is "to provide means for producing complete gasification of the coal treated, by gasifying the tar produced, which is usually collected, and passing its vapours up through the retorts into the gasified products of the rest of the coal."

The invention may be conveniently applied to a vertical retort furnace having the auxiliary heating means in patent No. 164,935.

The illustration shows the application of the invention applied to a vertical retort-setting terminating at its lower end in a generator; the whole of the coal being gasified in the plant with the exception of such portion as is collected in the form of tar condensed from the gas produced, and even this tar may be gasified by introducing it into a chamber at the side of the incandescent fuel in the generator.

The improvement according to the invention consists in constructing an arch extending over the generator so as to afford suitable spaces into which the tar may be sprayed on to the incandescent fuel.

The arch C extends over the generators, and, while serving to support the setting, affords spaces in which the tar can be effectively sprayed, as at D, on to the incandescent coke at a part above the steam-blast, which is not shown but is admitted at the level of the grate E.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 30.]

Nos. 34,058 to 34,767.

BEARD, G. F. H.—"Roller axles of spirally-guided gasholders." No. 34,471.
BERRY, J.—"Prepayment mechanism of gas, &c., meters." No. 34,548.
DEMPSTER, LTD., R. & J.—See Beard, G. F. H. No. 34 471
DUCKHAM, SIR A. M.—"Process for fixation of nitrogen." No. 34,280.
FALK, G.—"Portable gas-heaters." No. 34,673.
FALK, STADELMANN, & CO., LTD.—See Falk, G. No. 34,673.
GLOVER, W. R —"Coin-freed gas-meters." No. 34,244.
GLOVER, W. R.—"Prepayment gas-meters." No. 34,245.
GREGSON, LTD., KING, TAUDEVIN, &.—See King.
GREGSON, W.—See King, Taudevin, & Gregson, Ltd. No. 34,723.
HELPS, G.—"Gas cookers." No. 34,089
KING, TAUDEVIN, & GREGSON, LTD.—"Furnaces, kilns, &c." No. 34,723.
MAYLOR, J. A.—See Berry, J. No. 34,548.
METERS, LTD —See Berry, J. No. 34,548.
MORGAN, J. S.—"Distillation of tar." No. 34,279.
RIDER, D.—See Morgan, J. S. No. 34,279.
SCOTT, J. W.—See Beard, G. F. H. No. 34,471.
STADELMANN & CO., LTD., FALK.—See Falk. No. 34,673.
SVENSKA AKTIEBOLAGET GAS-ACCUMULATOR.—"Receivers for storing gas under pressure." No. 34,527.
TAUDEVIN, & GREGSON, LTD., KING.—See King.
TERRES, E.—"Methods of producing gases for heating, &c." No. 34,391.
THERMAL INDUSTRIAL & CHEMICAL (T.I.C.) RESEARCH CO., LTD — See Morgan, J. S. No. 34,279.
THOMPSON, W. E.—"Gas-meters." No. 34,078.
TULLEY, C. B.—"Manufacture of gas for heating and lighting." No. 34,302.
TULLEY, C. B.—"Apparatus for generating gas from coal." No. 34,303.
WATSON, J. H.—"Gas-boiler." No. 34 458.
WOODALL, DUCKHAM, AND JONES (1920), LTD.—See Duckham, Sir A. M. No. 34,280.

Kildwick and the Therm Basis.—There is growing opposition by local councils in the area of supply of the Kildwick Gas Company to the Company's application for power to charge a maximum of 1s. 8d. per therm, instead of the present price of 5s. per 1000 c.ft. The therm rate proposed would be equivalent to 8s. 4d. per 1000 c.ft.; and though the Company declare they do not expect to have to charge the maximum, the local authorities of the neighbourhood hold that the figure named is far too high, in view of the downward tendency of wages and costs. The Keighley and Skipton Rural District Councils are taking part in the opposition.

Gas Supply in the Bonnyrigg District.—In connection with a temporary shutting-off during daylight hours of the gas supply by the Bonnyrigg and Lasswade Gas Company, Ltd., it is explained that, on account of the abnormal demands on the Company recently, the gas lighting—especially in the outlying districts—had been rather meagre; and it was to safeguard the lighting arrangements that the step had been reluctantly resorted to. During the miners' strike many additional gas cookers and heating apparatus were put into houses and other establishments, on account of the shortage in the coal supply. The stoppage of mining work had also delayed the delivery of additional retorts ordered as a reserve. They had only come to hand a month ago, and were being put into operation with all speed.

Gas Coal.—In their review of the coal market last year, the "Iron and Coal Trades Review" says: "Prior to the commencement of the stoppage, gas concerns had great opportunities of building-up their reserves, and as a result they were able to give fairly satisfactory service—assisted by such outcrop of coal as was available—for the greater period of the stoppage. Some works, however, were compelled to close-down. When work restarted at the pits, gas concerns received preferential deliveries, and built-up their reserves as speedily as possible. By the end of August, this had been done; and since then deliveries have been on the basis of current requirements. Many gas-coal contracts were entered into in July at fixed prices to the end of the year; some being on the basis of the level of wages, but collieries have given reductions in all cases from Nov. 1. These reductions were from 2s. 6d. to 4s. per ton, according to circumstances."

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATION.

The following further notices have appeared in the "London Gazette" under the Gas Regulation Act.

SPECIAL ORDER.

Sandwich Corporation.

Application is to be made by the Corporation for a Special Order under section 10 to extend the limits of supply of gas so as to include the parish of Stonar, the parish of Worth, and parts of the parishes of Woodnesborough and Ash-next-Sandwich; to confer further powers upon the Corporation in regard to their gas undertaking; and to authorize them to use the sinking fund instead of borrowing.

DECLARATIONS OF CALORIFIC POWER.

Aylesbury Gas Company.—450 B.Th.U. (Dec. 24.)
Bawtry and District Gas Company.—500 B.Th.U. (Dec. 30.)
Blyth Gas Company.—450 B.Th.U. (Dec. 24.)
Borough of Burnley.—475 B.Th.U. (Dec. 28.)
Borough of Macclesfield.—420 B Th.U. (Jan. 1)
Bournemouth Gas and Water Company.—450 B.Th.U (Dec. 24.
Broadstairs Gas Company.—450 B.Th.U. (Dec. 24)
Brodsworth and District Gas Company—500 B.Th.U. (Dec. 30.)
Budleigh Salterton Gas Company, Ltd.—460 B.Th.U. (Dec. 28.)
Bury St. Edmunds Gas Company.—500 B.Th.U. (Jan. 1.)
Cannock, Hednesford, and District Gas Company, Ltd.—450 B.Th U. (Dec. 30.)
Chepstow Gas Company.—470 B.Th.U. (Dec. 28)
Cleethorpes Gas Company.—450 B.Th.U. (Dec. 24)
Dinnington and District Gas Company, Ltd.—450 B.Th.U. (Dec. 30.)
Dunstable Gas and Water Company.—450 B.Th.U. (Dec. 24.)
Earby and Thornton Gas and Lighting Company, Ltd.—500 B.Th.U. (Dec. 21.)
Exmouth Gas Company.—500 B.Th.U. (Dec. 31.)
Faversham Gas Company.—450 B.Th.U. (Dec. 27.)
Felixstowe Gas Light Company.—450 B.Th.U. (Dec. 30.)
Hastings and St. Leonards Gas Company.—460 B.Th.U. (Dec. 28.)
Keswick Gas Company.—500 B.Th.U. (Dec. 30.)
Leatherhead Gas and Lighting Company.—500 B.Th.U. (Dec. 29.)
Leighton Buzzard Gas Company.—480 B.Th.U. (Dec. 24)
Littlehampton Gas Company—470 B.Th.U. (Dec. 28.)
Llanelly Gas Light Company.—425 B.Th.U. (Dec. 30.)
Merthyr Tydfil Gas Company.—430 B.Th.U. (Dec. 23)
Normanton Gas Company.—425 B.Th.U. (Dec. 30.)
Pembroke District Gas Company—450 B.Th.U. (Dec. 24.)
Plymouth and Stonehouse Gas Light and Coke Company.—450 B.Th.U., instead of the present declared calorific value of 425 B.Th.U. (March 31.)
Pudsey Coal Gas Company.—500 B.Th.U. (Jan. 1.)
Rickmansworth Urban District Council.—475 B.Th.U. (Dec. 28.
Romford Gas and Coke Company, Ltd.—450 B.Th.U. (Dec. 24.)
Shanklin Gas Company.—450 B.Th.U. (Dec. 25.)
Shrewsbury Gas Light Company.—450 B.Th.U. (Dec. 30.)
Taunton Gas Light and Coke Company.—460 B.Th.U. (Jan. 1.)
Tunbridge Wells Gas Company.—450 B.Th.U. (Dec. 30.)
Ventnor Gas and Water Company.—500 B.Th.U. (Dec. 30.)
Walton-on-Thames and Weybridge Gas Company.—450 B.Th.U. (Dec. 31.)
Weston-super Mare Gas Light Company.—450 B Th.U. (Dec. 24.)
Whitwell and District Gas Company.—500 B.Th.U. (Dec. 30.)
Winchester Water and Gas Company.—450 B.Th.U. (Dec. 28.)
Yeadon and Guiseley Gas Company.—475 B.Th.U. (Dec. 24.)
York Town and Blackwater Gas Company.—450 B.Th.U. (Dec. 25.)

GAS REGULATION ACT ORDERS.

There have been forwarded by the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Abingdon Gas Light and Coke Company, Ltd.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 20 4d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Dec. 29.)

Aylesbury Gas Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 17·8d. per therm; and this price shall be substituted for the price of 3s. 11d. per 1000 c.ft. wherever it occurs in section 39 (dividend dependent on price charged) of the Aylesbury Gas Act, 1905.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

After the declared date, the words "1d. per therm" shall be substituted for the words "5d. per 1000 c.ft.," the words "1·2d. per therm" shall be substituted for the words "6d. per 1000 c.ft.," and the price of 7 8d. per therm shall be substituted for the price of 3s. 6d.

per 1000 c.ft. in section 41 (as to the supply to public lamps and to large consumers) of the Aylesbury Gas Act, 1905.

After the declared date, the words "1·2d. per therm" shall be substituted for the words "6d. per 1000 c.ft.," and the words "12d." shall be substituted for the words "2s. 10d." in section 42 (gas for power purposes) of the Aylesbury Gas Act, 1905.

Prepayment meter clauses are included. (Dec. 21.)

Bilston Gas Light and Coke Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 15·4d. per therm; and this price shall be substituted for the price of 3s. 6d. per 1000 c.ft. wherever it occurs in section 19 (fixing maximum price of gas with sliding-scale as to dividend) of the Bilston Gas Order, 1883.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-three-fifths. (Dec. 28.)

Blyth Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 15·6d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-three-fifths.

After the declared date: (1) The words "2·4d. per therm" shall be substituted for the words "1s. per 1000 c.ft." wherever they occur in sub-section 3 *A* of section 5 (extension of limits of supply) of the Blyth and Cowpen Gas Act, 1913. (2) "0·2d." shall be substituted for "1d." in the said sub-section. (3) "1·2d." shall be substituted in the said sub-section for "6d." (4) "therm" shall be substituted in the said sub-sectiod for "1000 c.ft.," except where these words secondly and thirdly occur in the first proviso to the said sub-section. (5) "4·2d. per therm" shall be substituted for "1s. 9d. per 1000 c.ft." in sub-section 3 *B* of section 5 of the Blyth and Cowpen Gas Act, 1913.

Prepayment meter clauses are included. (Dec. 21.)

Bournemouth Gas and Water Company.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be, until Dec. 31, 1921, 17·2d. per therm, and thereafter shall be 16·2d. per therm. (2) The word "therm" shall be substituted for "1000 c.ft." in section 22 (price of gas in Poole district) of the Bournemouth Gas and Water (Poole Gas Transfer) Act, 1902. (3) The word "therm" shall be substituted for "1000 c.ft.," "1·2d." shall be substituted for "6d.," and "0·8d." shall be substituted for "4d." in section 28 (price of gas in Christchurch district) of the Bournemouth Gas and Water Act, 1913. (4) "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." in section 29 (price of gas in area in third schedule) of the Bournemouth Gas and Water Act, 1913.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

After the declared date, the word "therm" shall be substituted for "1000 c.ft." wherever it occurs in section 50 (supply of gas to public lamps) of the Bournemouth Gas and Water Act, 1873. (Dec. 23)

Cannock, Hednesford, and District Gas Company, Ltd.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be 14·8d. per therm. (2) The price of 15·4d. per therm shall be substituted for the price of 3s. 6d. per 1000 c.ft. mentioned in section 21 (price of gas with sliding-scale as to dividend) of the Cannock Gas Order, 1911.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

Prepayment meter clauses are included. (Dec. 29.)

Chepstow Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16·2d. per therm.

As from the declared date, "1d. per therm" shall be substituted for "5d. per 1000 c.ft." in section 44 (prices in added limits of supply) of the Chepstow Gas Act, 1918.

As from the declared date, "0·1d. per therm" shall be substituted for "½d. per 1000 c.ft." in section 41 (benefit fund) of the Chepstow Gas Act, 1918.

As from the declared date, "0·1d. per therm" shall be substituted for "½d. per 1000 c.ft." in section 43 (power to grant pensions, &c.) of the Chepstow Gas Act, 1918.

Prepayment meter clauses are included. (Dec. 28.)

Cleethorpes Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 13·4d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." in section 20 (price of gas in additional limits) of the Cleethorpes Gas Order, 1912. (Dec. 22.)

Dunstable Gas and Water Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers within the borough of Dunstable shall be 16d. per therm, and in respect of gas supplied without the borough shall be 17·5d. per therm.

As from the declared date, the word "therm" shall be substituted for "1000 c.ft." in section 50 (for the supply of gas to public lamps) of the Dunstable Gas and Water Act, 1871, and in section 42 (amendment of section 50 of Act of 1871) of the Dunstable Gas and Water Act, 1912; and "14d." shall be substituted for "3s. 4d." in the latter section.

Prepayment meter clauses are included. (Dec. 22.)

Exmouth Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, the undertakers may demand by way of rent for the hire of ordinary meters rates which shall not exceed by more than 50 p.ct. the rates mentioned for corresponding meters in the schedule to the Exmouth Gas Act, 1865.

Prepayment meter clauses are included. (Dec. 28.)

Faversham Gas Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 17d. and 18d. per therm; and these prices respectively shall be substituted for the prices of 3s. 11d. and 4s. 5d. per 1000 c.ft. mentioned in section 7 (varying illuminating power standard price and dividend) of the Faversham Gas Act, 1903.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-seven-tenths.

Prepayment meter clauses are included. (Dec. 23.)

Felixstowe Gas Light Company.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be 16·8d. per therm. (2) "2·4d. per therm" shall be substituted for "1s. per 1000 c.ft." in section 65 (as to standard price and dividend) of the Felixstowe Gas Act, 1904.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Dec. 24.)

Great Grimsby Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 14d. per therm.

After the declared date, the price of 12·8d. per therm shall be substituted for the price of 3s. 3d. per 1000 c.ft. wherever it occurs in section 26 (sliding-scale as to dividend on new capital) of the Great Grimsby Gas Order, 1885; and the words "fifth of a penny" shall be substituted for the word "penny" wherever it occurs in that section.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

After the declared date, "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." in sub-section (3) of section 4 (extension of limits of supply) of the Great Grimsby Gas Act, 1910. (Dec. 31.)

Hastings and St. Leonards Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16·6d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-three-fifths. (Dec. 22.)

Huntingdon and Godmanchester Gas and Coke Company, Ltd.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be 15·6d. per therm. (2) "1d." shall be substituted for "5d." in section 20 (fixing maximum price of gas with sliding-scale as to dividend) of the Huntingdon and Godmanchester Gas Order, 1890.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five. (Dec. 29.)

Llanelly Gas Light Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 19d. and 20d. per therm; and these prices respectively shall be substituted for the prices of 4s. 1d. and 4s. 6d. per 1000 c.ft. mentioned in section 21 (sliding-scale) of the Llanelly Gas Act, 1908.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-third.

Prepayment meter clauses are included. (Dec. 24.)

Leatherhead Gas and Lighting Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16 8d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per

1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

After the declared date, "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." in section 38 (limiting price of gas to be charged in Cobham district) of the Leatherhead Gas Act, 1912.

Prepayment meter clauses are included. (Dec. 29.)

Macclesfield Corporation.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 14d. per therm. (Dec. 29.)

Manningtree and Mistley Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 21d. per therm; and this price shall be substituted for the price of 5s. 2d. per 1000 c.ft. wherever it occurs in section 23 (price of gas) of the Manningtree and Mistley Gas Order, 1900.

As from the declared date, "therm" shall be substituted for 1000 c.ft., and "fifth of a penny" shall be substituted for "penny" in paragraph 11 of Schedule B to the Manningtree and Mistley Gas Order, 1900. (Dec. 22.)

Normanton Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18·2d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

The minimum permissible pressure at which gas shall be supplied by the undertakers shall be such as in any main, or in any pipe laid between the main and the meter having an internal diameter of 2 in. and upwards, to balance a column of water not less than 2 in. in height. Provided that: (1) The foregoing provision shall not apply to that part of the urban district of Normanton lying beyond a radius of 1363 yards measured from the old Market Cross situate at the junction of Castleford Road and High Street, or to the urban district of Altofts; and the pressure at which all gas supplied by the undertakers to any consumer within the areas as defined above shall be supplied shall be such as in any main, or in any pipe laid between the main and the meter having an internal diameter of 2 in. and upwards, to balance a column of water not less than 18-10ths of an inch in height in the first-mentioned area, and 15-10ths of an inch in height in the second-mentioned area. (2) If the declared calorific value is less than 350 B.Th.U., the minimum permissible pressure at which gas may be supplied shall be that specified in the schedule to this Order. (Dec. 28.)

Pembroke District Gas Company.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be 16·8d. per therm. (2) The price of 15·6d. per therm shall be substituted for the price of 4s. 6d. per 1000 c.ft. wherever it occurs in section 65 (price of gas) of the Pembroke District Gas Act, 1919. (3) "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." wherever it occurs in the said section.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

After the declared date, "0·1d. per therm" shall be substituted for "¼d. per 1000 c.ft." in sub-section (1) of section 95 (benefit fund) of the Pembroke District Gas Act, 1919.

After the declared date, "0·1d. per therm" shall be substituted for "¼d. per 1000 c.ft." in section 97 (power to grant pensions, &c.), of the Pembroke District Gas Act, 1919.

Prepayment meter clauses are included. (Dec. 22.)

Redcar Urban District Council.

As from the declared date, the following provision shall have effect in lieu of the provisions of section 23 (price of gas) of the Redcar Urban District Council Gas Act, 1920: The price to be charged by the undertakers for gas supplied by them to persons who shall burn the same by meter shall not at any time exceed the sum of 16d. per therm or such higher price per therm as may be approved by the Board of Trade and as will not be more than sufficient, so far as can be estimated before the commencement of the period for which the charge is made, to enable the gas undertaking to be carried on without loss during that period.

Prepayment meter clauses are included. (Dec. 23.)

Rickmansworth Urban District Council.

As from the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 22d. and 23d. per therm; and these prices respectively shall be substituted for the prices of 4s. 7d. and 5s. per 1000 c.ft. mentioned in section 28 (limiting price of gas) of the Rickmansworth Gas Act, 1903. (Dec. 21.)

Rossendale Union Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17d. per therm.

Shrewsbury Gas Light Company.

After the declared date: (1) The prices of 16·2d. and 17·2d. per therm respectively shall be substituted for the prices of 2s. 11d. and 3s. 4d. per 1000 c.ft. whenever they occur in section 28 (price to be charged for gas supplied to persons who shall burn same by ordinary meter) of the Shrewsbury Gas Act, 1901. (2) 1·2d. per therm shall be substituted for 6d. per 1000 c.ft. in the said section.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Dec. 20.)

Tunbridge Wells Gas Company.

After the declared date: (1) The standard price in respect of gas supplied by the undertakers shall be 16·2d. per therm within the borough of Tunbridge Wells as constituted at the date of this Order, and 18d. per therm without those limits; and section 24 (limiting charge for supply of gas by meter) of the Tunbridge Wells Gas Act, 1887, shall be construed accordingly. (2) The price of 15·6d. per therm shall be substituted for the price of 3s. 6d. per 1000 c.ft. wherever it occurs in the said section. Provided that, notwithstanding anything contained in this section, Article 9 of the agreement set forth in the First Schedule to the Tunbridge Wells Gas Order, 1921, shall continue to have effect.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Dec. 28.)

Ventnor Gas and Water Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 23·4d. per therm. (Dec. 23.)

Walton-on-Thames and Weybridge Gas Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 20d. (Dec. 22.)

Weston-super-Mare Gas Light Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15·8d. per therm. (Dec. 22.)

THE GAS INDUSTRY IN NEWCASTLE.

Among the other important local industries, attention is given by the "Newcastle Daily Chronicle," in a review of the past year, to the conditions locally governing the gas industry, which, it is remarked, as in the case of every other industry, varied to an enormous extent during the year. From January until the commencement of the miners' dispute in April, the sales of gas by the Newcastle-upon-Tyne and Gateshead Gas Company showed an increase of 7 p.ct. over the previous year; but since the termination of the stoppage, the sales have shown a decrease of 12 p.ct. In January the price of gas coke was 60s. per ton for export. Large stocks were accumulated; and the price quickly fell to half the figure. Sulphate of ammonia and tar products prices also collapsed at a rapid rate; and as the Company were under their Acts unable to charge more than 3s. 4d. per 1000 c.ft. in Newcastle and Gateshead, they lost money at a heavy rate every day.

In the early part of May, they were authorized by the Board of Trade to increase the price of gas; but by this time the miners' dispute had been running for over a month, with very disastrous results, and involving the Company in a loss of over £50,000. During the dispute, the Company managed with great difficulty to maintain a supply of gas; and the public learned to realize the dependability and desirability of a gas supply. The one benefit that the Company derived from the dispute was that their stocks of coke were cleared; and were immensely useful to the public long after the coal supplies had ceased.

With the authorization by the Board of Trade to increase the price of gas, the Company were, in accordance with the Gas Regulation Act, compelled to change the method of charging from cubic feet to heat units. The Company charge on a standard of 475 B.Th.U. per cubic foot, which means that in 1000 c.ft. there are 475,000 B.Th.U.; and as a therm equals 100,000 B.Th.U., it follows that 1000 c.ft. are equal to 4¾ therms.

The use of gas for industrial purposes has not been quite so much to the fore, owing to the general depression in trade; but some progress has been made—notably in the adaptation of large boiling vats for varnish, bitumen, &c. Burners to consume gas at the rate of 750 c.ft. per hour have been constructed; and these mark a distinct advance. In the burners the importance of intimate flame contact has been realized, with resultant economy and speed of operation. As trade revives, so will the development of gas for industrial purposes.

While the domestic consumption has in the total shown a decrease since the coal stoppage, the demand which has set in during the last three months for gas apparatus is remarkable; and orders have been taken for 1000 gas-fires per month. This is probably because of less prosperity, and households reducing their hired labour. The Company, in order to assist those who wish to have gas-fires and yet cannot see their way to purchase them, have re-commenced letting fires out on hire and fixing without initial charge. The Company were among the first, if not the first, of the large undertakings to re-commence the hiring business; and it has been greatly appreciated.

The Company's new showrooms in Grainger Street West, which were opened in February last, have been of great value. The Company endeavour to give good service; and with an improvement in general trade and reductions in the price of gas—one of which, representing 1d. per therm or 4⅔d. per 1000 c.ft., has already been made—there is, it is believed, a bright prospect for greatly increased business in the district.

South Metropolitan Gas Company's Roll of Honour.—On a sheet, beautifully designed by Mr. E. W. Gilbert, and worthy of the best frame that can be procured for it, have been reproduced the names and photographs of the large number of men comprising the South Metropolitan Gas Company's Roll of Honour. During the war, 3745 of the Company's employees served their King and Country; and of these 386 gave their lives, and 639 suffered from wounds. There are coloured illustrations of both women and men at work during the war; and in the centre is a brief history of the Company's and employees' war fund, and a list of the honours and decorations won.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 2.

Business in the London tar products market has, as is customary at this period, been practically *nil*. Pitch remains firm at about 62s. 6d. net per ton f.o.b. at makers' works, and creosote, in large quantities, is worth about 7d. per gallon in bulk. There is nothing of note about other products.

The Federation have issued new prices for their sulphate of ammonia for home farmers for January to May next.

Tar Products in the Provinces.

Jan. 2.

There has been very little business doing in tar products during the past fortnight; and while manufacturers are maintaining their prices at the figures asked by them, business is practically impossible. Pitch is again very quiet, with a complete absence of orders; but the position is inherently very sound indeed. Stocks in the country are very small. The production of tar is abnormally low by reason of the fact that so few of the coke ovens are working; while there is no evidence that either the Continent or South Wales have purchased any appreciable quantity for this year's requirements. Creosote oil is steady. There is a fair inquiry from America; but the prices asked by makers, combined with the improvement in the rate of exchange, appears to have stopped business for the present. Benzole is, of course, moving off freely for motor purposes. There have been some inquiries for bure benzole for fine chemical manufacture; but at the prices asked, buyers state that it is quite impossible for them to compete with Continental manufacturers, who are getting their supplies of raw material on much more reasonable terms. Solvent naphtha is quiet, and present prices seems to be maintained with difficulty. Carbolic acid is still a very nominal market, and even the small production prevailing at present appears to be in excess of the demands of the crystal makers. Naphthalene continues very quiet indeed, and a comparatively small quantity of this article is being made. Crude benzole is still very firm, and prices are reported which appear to be out of all proportion to the value of its various constituents.

The average values for gas-works products during last week were: Gas-works coal tar, 37s. 6d. to 42s. 6d. Pitch, East Coast, 50s. to 52s. 6d. f.a.s. and 55s. to 57s. 6d f.o.b.; West Coast—Manchester, 47s. 6d. to 50s.; Liverpool, 47s. 6d. to 50s.; Clyde, 50s. to 52s. 6d. Benzole 90 p.ct. North, 2s. 3d. to 2s. 4d.; crude 65 p.ct. at 120° C., 1s. 9½d. to 1s. 10½d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 2s. 10d. to 3s. nominal. Coal tar crude naphtha in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 2s. 3d. to 2s. 7d. Heavy naphtha, North, 2s. 3d. to 2s. 5d. Creosote, in bulk, North, liquid, 6d. to 6¼d.; salty, 5¾d. to 5⅞d. Heavy oils, in bulk, North, 8d. to 8¼d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £14 to £18; salts, £5 10s. to £6 10s., bags included. Anthracene, "A" quality, 7d. to 8d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Owing to the closing-down of many of the large works during the holidays, there has been very little business in coal-tar products since my last report. There has been a better demand for pitch, and prices are slightly firmer than when last quoted. There is also a good demand for creosote, which is quoted at 6d. to 6¼d. per gallon for early delivery. Forward deliveries are also a trifle firmer at 6d. per gallon for January-June. Carbolic acid is quite without change, and cresylic acid is uninteresting, with no business passing—97-99 quality being quoted at 2s., and dark 95-97 at 1s. 9d. Naphthalenes are a dull market at £17 for refined and £5 10s. to £8 for crude. Solvent naphtha is still about 2s. 3d. per gallon. Benzole is a trifle cheaper—90's being 2s. 3d. to 2s. 6d. per gallon, with pure at 3s. 3d. to 3s. 6d. per gallon. In intermediate products there is very little change to report; but it is worth noting that moderate purchases have been made immediately following the Christmas holidays.

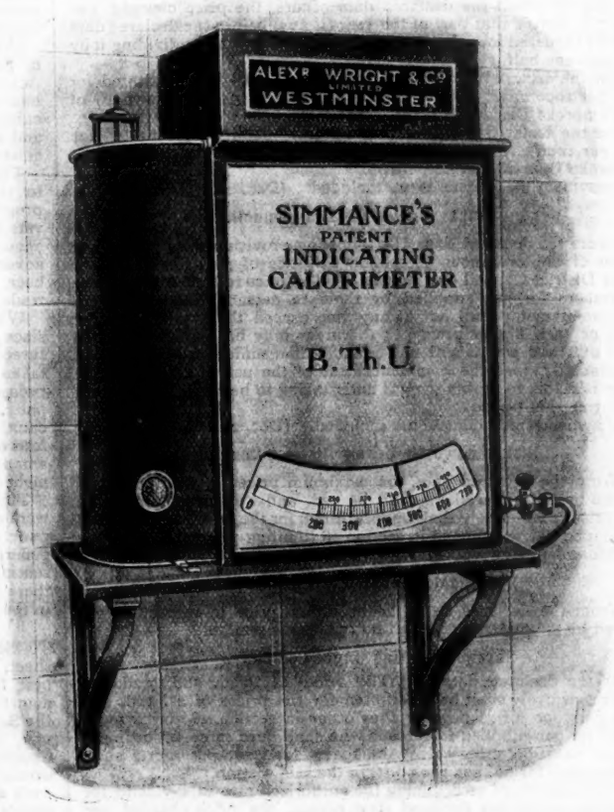
Sulphate of Ammonia.

This material is moving off slowly, farmers not being encouraged to purchase on the recent advance. The probability is, however, that the agricultural requirements will have to be met very shortly. Stocks of this material are not very great, and fair quantities are still being taken for export.

Company Work.—By a coincidence, a few days before the registration of Walter King Limited, a new publication for review, entitled "Converting a Business into a Private Company," was received from Messrs. Jordan & Sons, Ltd., of Chancery Lane. From our own newfound experience we can recommend this small and helpful book (which is published at 1s. net), and indeed any of Messrs. Jordan's publications, to any business man contemplating such a conversion.

A Clean Therm Report.—Mr. Owen Evans (the Engineer and Manager of the Wrexham Gas Company) has received the first quarterly report of the local Gas Examiner under the provisions of the Gas Regulation Act. It is a gratifying document to the Company, for it records the fact that, during the three months ended Dec. 31, they fulfilled their statutory obligations in respect of the gas supplied. With a declared calorific value of 450 B.Th.U., the average for the quarter has been 460·6 B.Th.U. On no day was the calorific value 6 p.ct. below 450 B.Th.U. On no occasion was sulphuretted hydrogen present; and there was no testing in which the pressure was less than 2 in.

CALORIFIC POWER AT A GLANCE.



Alexander Wright
& CO., LTD.,
WESTMINSTER, S.W. 1.

Gas Charge Reduced at Knowle.—Intimation has been made by the Knowle and District Gas Company, Ltd., of a reduction in the price of gas of 6d. per 1000 c.ft. The charge will then be 5s. 4d., less 3d. for prompt payment, making the net price 5s. 1d. per 1000 c.ft. Prepayment consumers will be given a discount equal to the reduction. This concession will leave the increase over the pre-war charge at 56 p.ct. only.

Further Storage Accommodation for Burnley.—The Burnley Gas Committee have decided to complete the purchase (deferred through the war) of the site at Old Hall for new gas-works; and they will proceed with the provision of additional storage accommodation, which is greatly needed. The Town Clerk has been instructed to apply to the Ministry of Health for sanction to borrow £80,000 for the erection of a holder on the new site.

Gas Prices at Smethwick.—Apparently Smethwick consumers are fortunate in not being asked to pay more for their gas. This was to be gathered from remarks made by Alderman Pinkney (the Chairman of the Gas Committee) to the Town Council last week. He pointed out that there was a loss on residuals which, looked at from a business point of view, would have meant an increase of 6d. per 1000 c.ft. The Committee, however, were struggling to avoid putting up the price; and what they were doing at the gas-works would, it was hoped, enable them to produce cheaper gas in the near future.

Swadlincote Gas Charges Increased.—The Swadlincote Urban District Council have obtained an Order from the Board of Trade sanctioning an increase in the price of gas up to 6s. 9d. per 1000 c.ft. within the district and 7s. 6d. outside. They have decided, in accordance with this, to raise the price of gas forthwith inside the district by 6d. per 1000 c.ft., and outside by 11d. This will bring the prices to 6s. 4d. and 7s. 3d. respectively. Mr. Goodhead (the Chairman of the Gas Committee) stated that they were now making more gas with less coal carbonized. This was due to the improved plant and to better coal. The undertaking was in a very much better position to-day than at this time last year; and great credit was due to the Manager (Mr. E. W. Wilson), who had been working hard to get everything in good order.

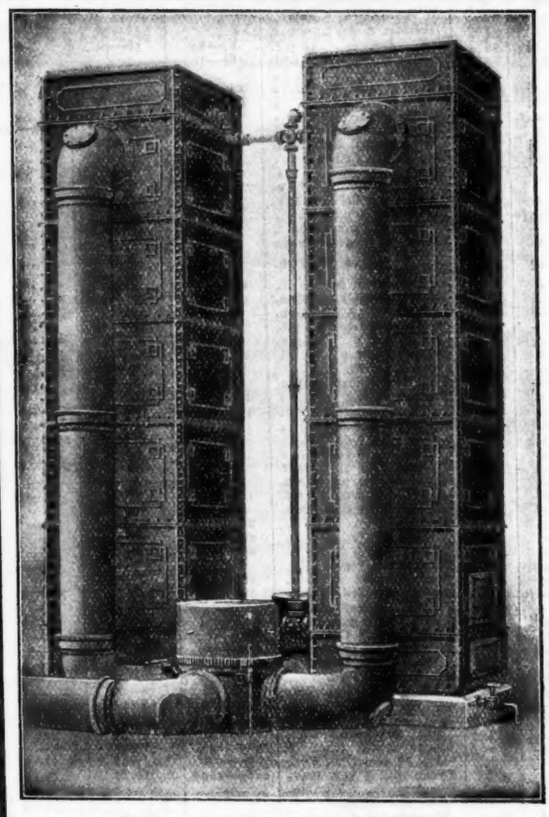
Leicester Gas Price to be Reduced.—The Leicester City Council have decided to reduce the price of gas by 6d. per 1000 c.ft. The Chairman of the Gas Committee (Mr. G. E. Hilton) said they generally waited for the annual balance-sheet; but on this occasion they had not done so, because coal was going down, labour was cheaper, and they had the full effect of the vertical retorts. It was possible that there would be a further reduction for the second quarter of the year; but he warned the Council that the balance-sheet would not be a favourable one. The coal strike cost them £60,000. They had to go to the reserve fund, which now stood at £63,848, instead of the £150,000 which they had powers for; and they had nothing towards the gas renewal fund of £150,000 for which they had just taken authority.

Fatality at Birmingham.—A verdict of "Accidental death" was returned by the Birmingham Deputy Coroner, in regard to the death of William Reynolds, of Erdington, an ironwork erector. While engaged at the Windsor Street Gas-Works, Reynolds was endeavouring, with other men, to lift a cowl which weighed about 1¼ cwt. up a spiral staircase to a platform 20 ft. high. The cowl was tied round a handrail, which broke, causing Reynolds to fall. He received injuries to the head which caused death.

Low-Temperature Carbonization, Ltd.—In view of the important developments which have followed as a result of the successful and continuous operation of the plant at Barnsley since August last (which, it is felt, should effect a complete change in the general position of the Company), the Directors have asked the shareholders to consent to the adjournment of the annual general meeting until they are in a position to place before them full details of these new arrangements. The Directors state that within the past few days they have received four inquiries for low-temperature plants in this country, and are now quoting for the work.

Dangerous Gas-Taps.—A labourer from Newcastle, named Ribchester, booked a bed at Ridley's Temperance Hotel in the city on Christmas Eve, and later was found staggering about from the effects of drink, and with the room full of gas. The tap was then turned off, and the window was opened, by the person who had noticed the smell. Next morning, as deceased was not seen, investigation was made, and he was found lying in bed unconscious, with the gas again turned full on. It transpired that there was no stop on the gas-tap; and the Coroner recorded a verdict of "Death from the effects of gas poisoning accidentally received."

Wicklow Gas Boycott.—The boycott of gas in Wicklow, on the refusal of the consumers' demand for a reduction in price from 12s. 6d. to 7s. 6d. per 1000 c.ft., continues. Mr. J. Everett presided at a conference between the Urban Council, the Employers' Federation, and Gas Company representatives, at which Mr. G. W. Anderson (the Managing Director of the Company) attended. Mr. Anderson having stated that consumers were not just yet to have the benefit of the reduction in coal price, was told that, in this case, it was a waste of time discussing the situation. The reduction in coal, said Mr. Anderson, was more than covered by increased wages, whereupon Mr. M. Montagh urged that too much was being made out of the wages question. Mr. D. H. Haskins said the Gas Company should cut their losses; but Mr. Anderson replied that the Company had not made profits during the war, and had nothing to cut. The profits for last year (1920) were £427. They had paid no dividends for three years, even with the price now complained of. When Mr. Haskins suggested 10s. per 1000 c.ft. as a compromise, Mr. Anderson said they had already declined this offer. He offered a reduction of 1s. 3d.—to 11s. 3d. A further offer to settle at 11s. was made by Mr. Haskins, amid protests from others present; but Mr. Anderson refused, and the conference terminated.



"BEARSCOT" TUBING IN WATER CONDENSERS EXTENDS UPWARDS OF 150 MILES.

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Walter Robinson, the manager, and Frederick Payne, a barman, were severely burned by an explosion of gas, on Christmas Day, at the "British Lion" public-house, in West Ham Lane, Stratford.

There is said to be a probability of the Gas Department of the Glasgow Corporation purchasing or leasing collieries to supply coal to the gas-works. The General Manager (Mr. J. W. M'Lusky) is to report on the subject.

It is announced that, as from the beginning of January, shipping charges on coal and coke are to be reduced at the West Coast ports served by the London and North-Western Railway and the Lancashire and Yorkshire Railway.

The Gas Committee of Edinburgh are to take a plebiscite of all the workers as to whether or not the new grading scheme for remuneration shall be put into operation. It was stated in Committee that a majority of the gas workers would be adversely affected if the new scheme were adopted.

The Glass Houghton and Castleford Collieries, Ltd., Castleford, have just appointed Mr. E. O. Greenhill, of No. 337, Gray's Inn Road, London, W.C., as their agent for London, the South of England, and the Eastern Counties.

Jane Wix, an elderly widow living at Walworth, was found dead in bed on Christmas Eve, with a piece of gas-tubing near her mouth and a petticoat over her head. A verdict of "Suicide while of unsound mind" was returned at the inquest.

Messrs. Ransomes, Sims, and Jefferies, Ltd., of Ipswich, have been appointed sole manufacturers and licensees in the United Kingdom, the Colonies and Dependencies, South America, the Dutch Indies, and China, for the patent Kestner water-tube boiler. This boiler has had a great success in France, where the highest economy is a *sine quâ non* in steam generation. It is manufactured in that country by the firm of Schneider & Cie., of Le Creusot, and is in use at many of the large municipal power stations.

STOCK MARKET REPORT.

THE Stock Exchange re-opened on Wednesday, after a somewhat lengthy Christmas holiday, for a brief working period of three days, sandwiched in between that festival and the New Year's vacation following. Thus isolated, the half-week could not be expected to present a busy scene; and markets, with the exception of one or two which have lately exhibited great activity, were uninteresting.

The gilt-edged division quite maintained its previous buoyancy. In Home Government issues there was a very good demand. The big four advanced their prices daily, and reached the following figures on Friday—viz., Consols 49⅞-50⅜, War Loan 92⅛-92 7/16, Funding 76 5/16-76⅜, Victory 81½-82. The rest—Bonds, New Colonials, &c.—were also in request.

Home Rails hesitated at first, but wound-up in good form, and prior charges were in constant demand. Canadians were rather shifty; but Argentines advanced, though there was some profit-snatching before the close.

The Foreign Market was strong at first, but became irregular later on. French, Argentine, Brazilian, and Russian came out well; but Italian and Japanese were less successful.

The Miscellaneous Market did not offer many strong points. Rubber was dull, and Oils were variable. Textiles were firmer.

Business in the Gas Market was of the quietest; the aggregate of the transactions recorded for the three days being no more in volume than what would amount to a fair show for one ordinary day's work. Eliminating the three big companies, there were only nine bargains in all the rest put together. However, there was no sign of any incipient weakness for lack of support, for several quotations showed further advances. Gas Light and South Metropolitan were among these. In Suburban and Provincial, British, Newcastle and Tynemouth advanced, and a large number of debenture issues were quoted *ex div.* at relatively higher figures. Imperial Continental was quiet and unchanged.

Bargains done for cash during the three days of the week on which the Stock Exchange was open—for it was closed on Monday and Tuesday—were as follows: On Wednesday, Gas Light ordinary 69⅜, ditto preference 65½, Imperial Continental 139, 140 (and "exceptional" 112½, 125), Liverpool 68⅝. Primitiva preference 39s. 3d., South Metropolitan 74½, 74⅝. On Thursday, Cape Town preference 5, Continental Union 19⅜. European 6 13/16, Gas Light ordinary 69¼, 69⅜. 69⅜, 69½, 70, ditto maximum 50⅞. 51, 51⅛, 51⅜, ditto preference 65⅛, 66, Imperial Continental 137½, 138, 139 (and "exceptional" 112½), South Metropolitan 75½, 76, ditto 6½ p.ct. debenture 103. On Friday, Buenos Aires debenture 46, Commercial 3½ p.ct. 59, Continental Union 20, Gas Light ordinary 69⅜, 69⅝, 69⅞, 70, 70¼, 70½, 70⅝, ditto maximum 51½, 52, Imperial Continental 137. Primitiva preference 39s. 6d., South Metropolitan 75⅝, ditto 6½ p.ct. debenture 103½.

In the Money Market, there was the usual seasonable demand, which was fully equal to normal proportions, and those desiring accommodation into the new year had to pay decidedly stiff rates; but day-to-day money could be had on easier terms. Discount terms, too, became tighter to some degree. Silver moved irregularly, closing easier at 34⅝d. The Bank rate is 5 p.ct., as fixed on Nov. 3.

The wages per hour of gas-fitters in the employ of the Birmingham Gas Department, the Birmingham and District Master Gas-Fitters' Association, and the Smethwick, West Bromwich, and Walsall Gas Departments have been reduced, under the agreement arrived at, in relation to the cost of living, to 1s. 8d. per hour, from Nov. 19.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
185,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Oct. 13	2½	3 1/2%	Alliance & Dublin Ord.	59—64	50—53	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd.	5½—6½	2½—3⅜	...
100,000	5	Aug. 11	16	4/7½	Bournemouth Gas and Water — 5 p.c.	...	7½—8½	...
383,110	10	,,	7	7/-	Bournemouth Gas and Water — B 7 p.c.	15—15½	8½—9½	...
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	Dec. 30	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	...	54—59*	...
992,043	Stk.	July 15	14	36/-	Brentford A Consolid.	261—266	77—82	...
734,920	,,	,,	11	55/-	Do. B New	204—209	77—82	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—72	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	93—98	57—59*	...
214,775	,,	Aug. 26	11	10 1/2%	Brighton & Hove Orig.	208—213	130—135	...
344,300	,,	,,	8	7 1/2%	Do. A Ord. Stk.	154—159	92—97	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 29	12½	10%	British	44—45	24—26	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	56—59*	...
845,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	45—47	43—46*	46
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—3½	6½—7½	...
100,000	10	Oct. 28	—	4 1/2%	Do. 4½ p.c. Pref.	4—6	4½—5½	5
100,000	Stk.	Dec. 30	4½	4 1/2%	Do. 4½ p.c. Deb. Stk.	70—75	56—60*	...
137,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/1 4	42/8	Commercial 4 p.c. Stk.	106—108	56—62	...
560,000	,,	,,	3½	3 1/2/4	Do. 3½ p.c. do.	103—105	55—60	59
475,000	,,	—	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	43—46*	...
800,000	,,	Dec. 15	4	—	Continental Union Ltd.	76—79	18—20	19½—20
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	33—38*	...
31,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	160—165	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	...	125—130	...
492,870	Stk.	—	6	4 1/2%	Derby Con. Stk.	125—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	Buropean, Ltd.	17½—18	6½—7	6 7/8
16,298,975	Stk.	Aug. 11	4/17/4	46/8	Gas 4 p.c. Ord.	98—102	69—71	69½—70½
2,600,000	,,	,,	3½	35/-	Light 3½ p.c. max.	76—79	50—52	50½—52
4,062,235	,,	,,	4	4%	and 4 p.c. Con. Pref.	96—99	64—66	65½—66
4,674,850	,,	Dec. 15	5	5%	Coke 3 p.c. Con. Deb.	72½—74½	50—52*	...
130,000	,,	Dec. 11	10	10%	10 p.c. Bonds.	...	...	...
82,500	,,	Sept. 14	5	5%	Hastings & St. L. 5 p.c.	...	48—50	...
258,740	,,	,,	3½	3½%	Do. 3½ p.c.	87—89	38—40	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16½	5—6	...
86,600	Stk.	Aug. 26	9	9%	Hornsey 7 p.c.	...	100—105	...
131,000	,,	July 28	7½	7½%	Ilford A and C	151—154	84—86	...
65,780	,,	,,	6½	5 1/2%	Do. B	115—118	61—63	...
63,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	56—58*	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	130—160	137—142	137—140
1,235,000	,,	Aug. 11	3½	3 1/2%	Do. 3½ p.c. Deb. Red.	84—86	78—83	...
235,242	,,	Aug 26	6½	6 1/2%	Lea Bridge Ord. 5 p.c.	110—121	72—74	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. — A.	211—213	...	68⅜
					Liverpool 5 p.c. Ord. — B.	146—148	...	...
306,085	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 11	7/3/6	6%	Maidstone 5 p.c.	...	54—56	...
63,480	,,	Dec. 30	—	5%	Do. 5 p.c. Deb.	...	40—43*	...
75,000	5	June 11	6	5%	Malta & Mediterranean	4½—4⅝	2—2½	...
250,000	100	Oct. 3	4½	4 1/2%	Met. of Melbourne 4½ p.c. Deb.	99—101	93—100	...
541,920	Stk.	Nov. 30	4	6%	Monte Video, Ltd.	11½—12	53—58	...
1,875,892	,,	July 28	4½	5%	Newcastle & Gatsh'd Con.	98½—99½	67—69	...
329,705	,,	June 30	3½	3 1/2%	Do. 3½ p.c. Deb.	82—85	51—53	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/0	5/3	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	Dec. 15	8	8%	Oriental, Ltd.	117—122	84—87*	...
60,000	5	—	10	—	Ottoman, Ltd.	7½—7⅞	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonesh'se 5 p.c.	...	66—68*	...
60,000	50	Aug. 26	15	60/-	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/-	Do. C	118—121	51—54	...
249,980	5	—	8	—	Primitiva Ord.	5½—6	⅛—¼	...
499,960	5	—	5	—	Do. 5 p.c. Pref.	4½—5	1 1/16—2 3/16	39/3—39/6
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	65—67	...
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1911	...	44—47	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	43—46*	...
150,000	10	Sept. 29	6	6/-	San Paulo 6 p.c. Pref.	10½—11	6—6½	...
125,000	50	June 30	5	5%	San Paulo 5 p.c. Deb.	47—49	36—39	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	64—66	...
209,984	,,	,,	10	5%	Do. B	222—224	64—66	...
523,500	,,	,,	10	4½%	Do. C	220—222	64—66	...
135,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	Oct. 28	9	8%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 28	5/4/0	5%	South Met. Ord.	111—115	74—76	74½—76
250,000	,,	July 14	—	5%	Do. Red. Pref.	...	93—95	...
1,805,445	,,	,,	5	5%	Do. 5 p.c. Deb.	72½—74½	49—51	...
224,820	,,	Dec. 15	8½	4 1/2%	South Shields Con. Stk.	157—159	86—88*	...
1,087,795	,,	Aug. 11	6	5 1/2%	S'th Suburb'n Ord. 5 p.c.	114—116	72—75	...
368,837	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	72—75*	...
647,740	,,	Nov. 16	7½	4%	Southampton Ord.	99—102	56—59	...
121,875	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	58—60*	...
120,000	,,	Aug. 11	—	6%	Tottenham A 5 p.c.	135—138	66—68	...
782,875	,,	,,	6	4½%	District B 3½ p.c.	115—117	57—60	...
181,855	,,	Dec. 15	4	4%	District 4 p.c. Deb.	87—89	53—56*	...
182,580	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
836,476	Stk.	Aug. 26	5	3 1/2%	Tynemouth 5 p.c. max.	108½—109	63—67	...
30,000	,,	Aug. 11	8½	66/3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	78—80	...
255,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	59—61	...
108,075	,,	,,	—	46/4½	Do. C	...	56—58	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	53—55	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	56—58	...
88,416	,,	Dec. 30	3	3%	5 p.c. Deb. Stk.	66—69	44—47*	...

* Ex Div.

Gas Troubles at Doncaster.—Speaking at the annual dinner of a local Motor Club, Councillor Morris (Chairman of the Doncaster Corporation Gas Committee) took the opportunity to make a public reply to comments on the gas supply which had been flung at him without notice at the last Council meeting, and which, for that reason and without opportunity to inquire, he had been unable to answer. He found that the cause of bad gas service had been a mishap at the works; and though this had been remedied, another breakdown had occurred on the same day, and on two following days the pressure had to be reduced. The Gas Committee did not know yet whether anybody at the works had been guilty of negligence; but they were determined to sift these troubles to the bottom.

Biddulph Gas Accounts.—The Treasurer reported to a meeting of the Biddulph Urban Council last week that there was an adverse balance on gas account of £2998. The Deputy Clerk (Mr. Dart) said it would take a considerable time to deal with the account; and the question was who should straighten the matter out, and keep it straight in future. He did not think the Council quite realized the great increase in the amount of work at the gas-works. He suggested that they should have a special meeting of the Gas Committee, and go carefully into the matter. Mr. Findlow agreed that there certainly was a great deal more work to be done, seeing that the output had increased from 3 million to 14 million c.ft. It was decided to have a special meeting of the Committee.

Stone Gas Company's Electricity Powers.—The question of the gas supply came up for discussion by the Stone Urban Council last week, when, in moving the adoption of the report of the Lighting Committee, Mr. R. F. Smith referred to an interview which had taken place between the Committee and Mr. A. Mackay, of Longton. He said that Mr. Mackay had brought about a considerable improvement in the quality of gas in the town. He had informed the Committee that it was the wish of the Directors of the Company that the public should have a proper and sufficient supply. Mr. Bagot asked whether, during the interview with Mr. Mackay, anything was said about electricity. They had waited many years for it; but the Company were simply talking about gas. Mr. Smith replied that the question of electricity was not discussed; but he agreed that it was a matter for future consideration. Mr. Haddon asked the Clerk what was the exact position in regard to the Gas Company and their powers of supplying electricity in the town; and the Clerk stated that some months ago, when the Gas Company made an application for an extension of the time laid down in their Act within which they were compelled to provide electricity, the Council wrote to the Board of Trade protesting against any such extension. The reply received stated that an inquiry would be held shortly in regard to the Government's proposals for the establishment of huge generating stations, when the matter in question would be dealt with.

Following recent criticisms of the gas and electricity charges in the district, the Spenborough District Council have appointed a Sub-Committee to consider the whole question of gas charges. Criticisms were made at the Council meeting as to the quality of the gas, and in regard to the exorbitant electricity charges for power purposes.

We have to acknowledge with thanks New Year's Greetings, accompanied by practical gifts in the form of calendars or memo books, from the following firms: Messrs. Simon Carvés, the Gas Meter Company, the Keighley Gas and Oil Engine Company, Peckett & Sons, the Torbay Paint Company, Mobberley and Perry, Ltd., and John E. Williams & Co.

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